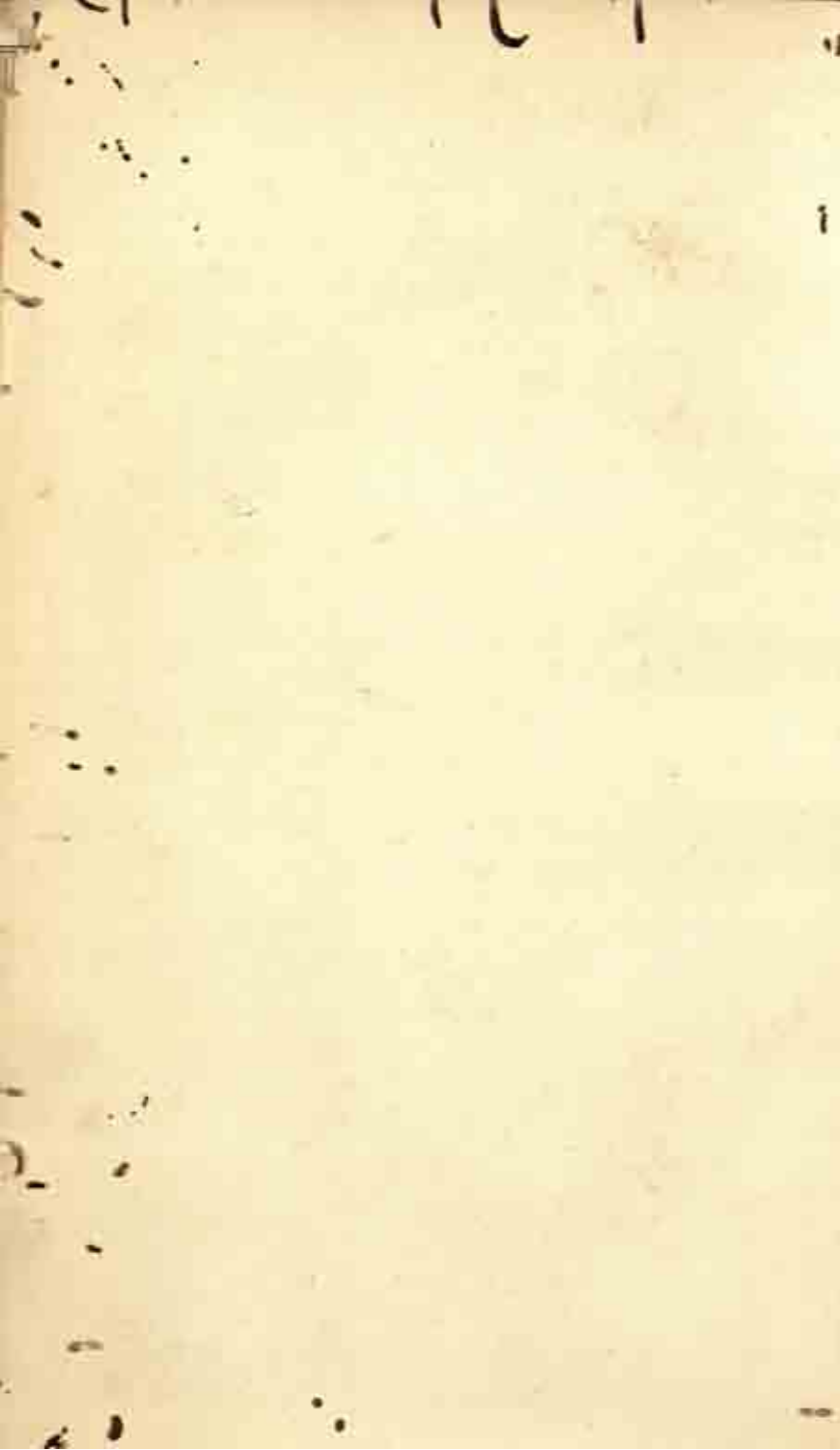


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PROCEEDINGS

OF THE

ROYAL GEOGRAPHICAL SOCIETY.



25276

VOL. XIII.

SESSION 1868-9.

Nos. I. to V.

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PROCEEDINGS
OF
THE ROYAL GEOGRAPHICAL SOCIETY.

[ISSUED FEBRUARY 10TH, 1869.]

SESSION 1868-69.

First Meeting, 9th November, 1868.

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT, in
the Chair.

ELECTIONS.—*Daniel Griffin, Esq.; M. Alezie de Lemnosoff; Dr. A. E. Mackay, E.N.; Lionel Shirley, C.E.*

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The PRESIDENT opened the Session with the following Address:—

GENTLEMEN,—In opening this Session—the fourteenth in which, through your good will, I have presided over you—I am sorry to have to commence my observations with the expression of deep regret, that, owing to the demolition of the fine palladian gateway, arcades, and wings of Burlington House, we have lost that capacious hall for our meetings, which had so long been placed at our disposal by the Royal Society and the University of London.*

* I was one of the deputation which, in the year 1856, waited on Lord Palmerston, when Prime Minister, to request that he would assign Burlington House and its accessories (then recently acquired by the Government) to the men of Science of the metropolis, for the transaction of their business and the meetings of their several bodies. In cordially assenting to our request, his Lordship, who was a great admirer of that noble specimen of Palladian architecture,—now, alas! dismantled,—added, that all which was required to render the edifice a fitting receptacle for men of Science and Letters, and at the same time a public

It has naturally been gratifying to me to have had it in my power to enable you to assemble, for the first day in this Session, in the theatre of the establishment which has been under my direction for the last thirteen years. On this occasion I am, therefore, quite at home, whether as the Geological Director or as the Geographical President. It will not, however, I must tell you, be possible to ask you to meet here again, inasmuch as on all the succeeding Mondays in the winter months this locality is bespoken and is most usefully occupied by the Professors of the Royal School of Mines in giving lectures to working men.

It having thus become my duty to look out for a "local habitation" elsewhere, I first applied to the authorities of the University of London, and by their kind consideration I was led to believe that we might very soon be permitted to assemble in the great hall of their new building, as, indeed, I announced in my last anniversary Address. But as that structure will not be completed before next summer, I next applied to the President and Managers of the Royal Institution, who have most kindly assented to my request. After this evening, then, our meetings will be held in that scientific theatre in Albemarle Street, wherein in past times the discoveries of Davy and Faraday were made known, and where in our days Tyndall is worthily sustaining the renown of that institution.

We thus tide over present obstacles; but I earnestly hope that, before long, Her Majesty's Government, seeing that no scientific body is more connected than we are with the Colonial and Foreign Departments of State and the commercial interests of the Empire, will not allow us to stand behind the other Societies, for whom most ample accommodation is supplied, but will aid us in establishing an adequate Geographical home.

Among the events which have transpired during our long vacation, I have to congratulate you on the very successful proceedings of the Section of Geography and Ethnology at the Norwich meeting of the British Association, and I specially commend to your notice the able Address of the President, Captain Richards, the Hydrographer to the Admiralty. I may here mention that the scientific products of those deep-sea soundings, to which he made such pertinent allusion in treating of submarine geography, will shortly receive much novel addition and striking illustration in a communication by Dr. Carpenter to the Royal Society, in which he will so explain the results of his recent dredging operations in the Northern

ornament, would be simply to remove the high brick wall in front, and replace it by a handsome open railing, through which the passers by in Piccadilly might admire the whole architectural scene. I place the fact on record, as a proof of the good taste in art of an illustrious and lamented statesman,

Seas, as to throw much new light on submarine life which will particularly interest the geographer and largely instruct the geologist.

Of all the events, however, which have transpired since we last assembled, nothing, I am sure, can have gratified us so much as the news which has recently reached us of the progress made by our eminent associate Livingstone, during the ten months which elapsed between the date of his last letters to me and others, and that of his last letter to Dr. Kirk, of December, 1867. His unrivalled perseverance and courage, in getting successfully through the many heavy trials to which he has been subjected, have been strengthened by his trust in that Divine Providence which has hitherto protected him during his heroic efforts, whether to advance human knowledge or to implant the truths of religion in the hearts of the negro race. In his last letters, which are extremely brief, he has not communicated the geographical results of his journey to the southern end of Lake Tanganyika. He speaks, however, of a chain of lakes connected by a river with Tanganyika, and has visited Cazembe and other towns belonging to the powerful negro chiefs of this remote part of the interior.

Awaiting, as I do, in fervent hope, the day when a national burst of joyfulness shall welcome the great traveller on his return to Britain, I may be allowed to say that throughout my long life I have never been so truly delighted as in finding that my persistence in the belief in the existence and in the successful progress of my illustrious friend has up to this time been fully verified. God grant that the last link may speedily be added to his long chain of adventures, and that Livingstone may bring us, in his own person, the history of all his wanderings!

The attention of our Society has been strongly drawn of late towards Central Asia, and particularly to the vast regions which border the north-eastern and north-western frontiers of British India. The principal region in the north-east embraces the country lying between Assam and Szechuen, the most westerly province of China. A warm desire was expressed by a committee of the British Association, as well as by our Council, that this intervening space, of about 250 miles only, should be explored, in order to ascertain if there be practicable passes through the high mountains and wild tracts which separate the upper waters of the Yangtse-kiang, from the Brahmaputra at its great bend near Sudiya. Although as yet no positive effort has been made to solve the important problem, endeavours are being carried on by the Indian authorities to open up a route for traffic, along a more southerly line, between British Burmah and the great Chinese province of Yunnan, now essentially

independent of Chinese rule, and most desirous of establishing a trade with our settlements on the Irrawaddy.

Of still more pressing importance, however, than an acquaintance with the regions just alluded to, is an exploration of the vast and unexamined tracts on the north-west, far beyond the tributaries of the Upper Indus—or between Peshawur and Jellalabad on the south, and the centres of trade and population at Yarkand and Kashgar. The main object is to define the physical character of the vast elevated plateau called Pamir, or “Roof of the World,” from which the Oxus and Zarafshan take their rise, and from which the lofty chains, the Kuen-Lun, the Himalaya, and Hindoo Koosh, radiate. In a former Address (1867), I dwelt upon the essential importance of such knowledge, to be acquired equally by the Russian Government and by our own; and I then said that this great table-land or watershed ought to be constituted the neutral ground between the two empires, and to be considered as a broad zone to be for ever interposed between Eastern Turkestan—towards which Russia is now advancing—and the most northern limits of our Indian possessions.

With a view to taking a first step in this desirable exploration, the Council of our Society sent out last spring a practised traveller, Lieutenant Hayward, to traverse this region from Peshawur. He offered himself, and indeed undertook the mission entirely on his own responsibility and risk, and, having a good acquaintance with the native dialects, he will proceed in the habiliments of the country. In a letter which I have received from him, he informs us that, owing to the turbulent state of some of the hill tribes beyond our frontier, he had been prevented from taking a direct route to Yarkand, and was therefore proceeding thither through Cashmir, with the intention of returning by the Pamir steppe. Already he has communicated to us a sketch-map of the region in question, which differs essentially from the published documents. This he has accomplished through a careful examination of the journal of an intelligent merchant of Yarkand, who describes so precisely every day's march, and the distance as well as the nature of the country he traversed, as to enable Mr. Hayward to prepare the map. The letter of this gentleman, and extracts from the diary of Mahomed Amin, the Yarkand merchant, will be read to you this evening, and the subject, including accounts of passes practicable for commercial enterprise, will be fully discussed, I hope, by Sir Henry Rawlinson and Lord Strangford, who have taken the deepest interest in it.

These papers will be followed by a memoir by the Russian geographer Severtsof, which throws great light on the whole region north of the River Jaxartes, which has been translated and con-

densed by Mr. Michell. The map and sections which accompany the description of the journey of M. Severtsof form considerable additions to our previous knowledge of the flanks of the western portion of the great chain, the Thian-Shan, the eastern extension of which forms the southern boundary of all the Russian explorations. In this way we commence our Session with subjects which are of great national importance as well as of deep interest to the geographer and statesman.

For my own part, I desire to see all the wild countries lying between the new acquisitions of Russia and British territory as well explored by Russian as by British geographers and explorers, in order that passes through the mountains may be delineated, to facilitate the traffic which must arise between those fertile tracts of Turkestan and our merchants of Western India.

The completion of such an object, accompanied as it must be by the improvement and civilisation of the inhabitants of the intermediate wild tracts, is surely well worthy of the endeavours of both nations, who will thus be as mutually interested in such an international commerce in Asia as was for a long period so advantageous to both in Europe.

It is not, of course, in my power to announce to you as yet many of the subjects which will be brought before you in the course of the session now commenced; but I may inform you that already we have in hand, besides papers on various parts of Central Asia, a memoir on Abyssinia by Dr. Blanc, the companion in captivity of Mr. Rassam, describing the western part of that region, which was not visited by the British army; also a well-digested account of the geography, statistics, and natural productions of Manchuria,—the great north-eastern province of China,—by Mr. Williamson, a missionary. The latter work, accompanied by a map (in which the correct outline of the coast and bays is taken from our excellent Admiralty charts, and the interior founded on the map of d'Anville), adds much to our previous knowledge, and contains a clear description of the fertility and rich productions, both vegetable and mineral, of this vast region, which cannot fail to interest the mercantile community of all civilised countries, whilst the physical geographer will be much struck with the delineation of the great mountains and rivers of a vast territory which still remains in perfect order under Chinese rule.

In concluding these few anticipatory remarks, I must say, that besides the results of the explorations of Livingstone in South Africa, to which we look forward so anxiously, I have received a map of the lake regions of Equatorial Africa from our medallist Dr. Petermann, which he has elaborated from data recently received

from the travellers Carlo Piaggia and Ambroise and Jules Poncet, who have pushed their researches across a portion of Central Africa hitherto unexplored, extending to 23° and 24° \pm long., and to a little more than one degree north of the Equator. As these extreme points are not less, according to Petermann's map, than from 500 to 600 miles west of Lake Albert Nyanza of Baker, and as M. Piaggia obtained information of the existence of another vast interior lake lying on the Equator and extending from the south of it, an entirely new field for research is thus laid open to the enterprise of explorers, who will have to determine whether the streams issuing from this immense lake, and the adjacent region to the west of 25° \pm long., do not flow from a watershed entirely separated from that of all the affluents of the Nile, and which sends its waters into the South Atlantic Ocean, and probably by the great river of Congo. I may add, that this is not the first information that geographers have received of the existence of another great equatorial lake to the west of the Albert Nyanza; but the accounts hitherto received have been more or less vague, and no European traveller has been so near to its shores as Carlo Piaggia. Much credit is due to the Marquis Antinori, himself a traveller in these regions, for adapting the itineraries of Piaggia to the positions established by English travellers, and publishing the results in the Bulletin of the newly-established Geographical Society of Italy.

With these few words of introduction, referring to some of the more important topics which are to come under your notice in the course of the session, I earnestly trust that the session now commenced may be one of as great interest as many of those which have preceded it.

The PRESIDENT, before calling upon the Secretary to read the first communication, said he was sure every person in the assembly would agree with him that they were greatly honoured by the presence of the Queen of the Netherlands, a lady who, accomplished in the highest sense of the word, took the deepest interest in the advance of Letters, Science, and Art.

He added that the announced programme of the proceedings for the evening would be a little deviated from, owing to his having most unexpectedly received a letter from the Foreign Office, enclosing letters from Livingstone himself, written to his friend, Dr. Seward, whom he still supposed to be Consul at Zanzibar. One of these letters would be read to the meeting.

The following letter of Dr. LIVINGSTONE's to Dr. Seward was read by Mr. Markham:—

"MY DEAR SEWARD,

"Town of Cazembe, 14th December, 1867.

"One of Seyd ben Ali's men leaves this to-morrow to join his master in Baira. He and Hamees have letters from me to you: one of these, in the hands of Hamees, repeats an order for goods, which I sent by Magara Mafupi

[Bunduki] in February last. If Magera Mafupi's letter came to hand, then the goods would be sent before the present letter can reach you. I have more feeling of the want of shoes than anything else. If you have any tracing paper I should like some; I lost a good deal in fording a river; some pencils and ink powder, if you can spare them, and an awl, and stick of sealing wax. I am going to Ujiji in two days, and think that I shall be able to send letters thence to Zanzibar sooner than my friends can reach it by Bagamoyo.

"Mocro is one of a chain of lakes connected by a river having different names. When we got there I thought it well to look at Cazembe, of which the Portuguese have written much; but all the geographical information is contained in letters I have written, which I mean to send from Ujiji, and have no heart to 'repeat myself.'

"Affectionately yours,

"DAVID LIVINGSTONE."

The PRESIDENT said the letter added little to what had already been communicated to the public. Livingstone announced his intention, positively, to come out of Africa by Zanzibar. In his letters to Dr. Kirk he spoke of his good health, and in other letters to Dr. Seward, which were of a private nature, he also spoke of his good health, and of the difficulties he had overcome. All these details would be hereafter communicated to the Society, when we had received the despatches which Livingstone had prepared, and which would come across from Ujiji to Zanzibar.

Mr. Markham next read a letter from Mr. G. S. W. HAYWARD, who is now travelling, on behalf of the Society, in the countries near the North-Western frontiers of India:—

"SIR,

"Murree, Punjab, 15th August, 1868.

"I have much pleasure in informing you of my arrival here on my way to Central Asia: it has been my endeavour to be as expeditious as possible, and by travelling up country via Central India, instead of the usual route up the River Indus, have saved much time.

"According to the wishes expressed in Sir H. Rawlinson's Memorandum for my guidance, it was my intention to have endeavoured to penetrate into Badakshan from Peshawur, but having been seriously warned by the Lieutenant-Governor of the Punjab that, 'in attempting to proceed by this route, you will not only endanger your own life, but be likely to compromise the British Government,' I have abandoned the idea of going from Peshawur, and am now about starting for Cashmere, and thence to Yarkand without delay. This being the safer route under the present circumstances, by proceeding by it I hope eventually to be able to accomplish successfully the objects in view. I am convinced that there is little danger in Yarkand itself, to any one acting with ordinary precaution, even in the event of being discovered to be an Englishman. The greater difficulty will be in returning from Yarkand by the Pamir Steppe, exploring the Steppe and Badakshan, and coming through the difficult country lying between the Hindu Kush and the north-west frontier. But, as by the time I arrive at Yarkand I ought to be quite 'au fait' at keeping up the disguise I shall assume, I feel very confident of success.

"I beg to enclose a description of a route from Jellalabad to Turkestan, via Chitral and Badakshan, which is from information supplied to the Punjab Government by a Yarkandi merchant, and which may not be known to the Geographical Society. I have also made a rough sketch-map, showing the country and route alluded to, and hope eventually to be able to prove the correctness, or otherwise, of the route given, from personal observation. Should it be in my power during my travels to forward any reports, plans, or informa-

tion, I will not fail to do so; but I fear that the great distance such communications will have to be sent before they can reach the frontier will effectually hinder my being able to do so; if even it would be advisable to send any, from the fact of the necessity of being in disguise. Hoping I may be able to succeed in returning with much valuable information, scientific and geographical,

"I have the honour to be, Sir, your obedient Servant,

"GEORGE S. W. HAYWARD."

"To the President,

Royal Geographical Society."

The following Paper was then read:—

On Trade Routes between Turkestan and India. By Major-General
Sir H. C. RAWLINSON, K.C.B., &c.

SIR HENRY RAWLINSON stated that on more occasions than one he had had the honour of drawing the attention of the Geographical Society to the fact that one of the most valuable results—if not the most valuable result—of all our researches and explorations had been the opening up of new routes for the trade and commerce of nations; and when he thus insisted on the great advantages to commerce, he did not merely allude to it as a means of enriching individual merchants and manufacturers; he looked at it from a far higher point of view. He believed commerce between nations to be a most important instrument in extending civilisation, in promoting peace, and in raising the social condition of the people who engage in it. When two countries stand in the relationship of producer and consumer, their material interests become so identified, that it is almost impossible they should go to war. At any rate, if commercial intercourse be not an absolute antidote to the passion for war, it greatly lessened the danger of collision, and it was in that point of view,—in order to establish a community of interests and thus to consolidate friendly relations,—that he thought it so very desirable to encourage and promote trade between our Indian empire and the nations of Central Asia.

He had put these observations together in order to explain to the meeting the grounds upon which he thought the subject worthy the consideration of the Royal Geographical Society. On two previous occasions he had explained these routes in detail. In the one he had given an exposition of the route of the Pundit from Lhasa to Lake Manasarowar, and in the other had endeavoured to illustrate the journey of Mr. Johnson from Leh to Khotan, and to point out the vast importance of that route. On the present occasion he would first give a few extracts from a Report on the trade routes between Thibet and Central Asia, written by Mr. Forsyth, the Government

Commissioner appointed to superintend the trade of Northern India. The great discovery which Mr. Johnson brought before the notice of geographers was the existence of an open road from Iliki, round the Kuen-luen Mountains, on to the Changthang Plains, by which, as he asserted, wheel-carriages could pass from the Himalayas direct into the plains of Central Asia. The verification of that route was still the great desideratum in Central Asiatic geography. The present reports confirmed many other statements of Mr. Johnson; but no one yet had been able to pass by that route. If it should be opened, it would be of immense advantage to trade: it would not only offer an open road, but it would very materially shorten the distance and lay open a country, fertile in supplies, to British commerce. Mr. Forsyth had not been able to glean further information regarding the Changthang route, but he had investigated a second route, which Mr. Johnson had previously brought to the notice of the Society. Mr. Forsyth's account proceeded as follows:—

"Two years ago when the question of opening out trade with Ladak and Central Asia was first broached, the state of affairs looked very unpromising.

"The road from Kulu through the outlying British province of Lahoul was scarcely passable for laden animals. As I travelled along Lahoul towards the frontier in 1866, my ears were assailed by continuous complaints of the oppression, exactions, and positive plunder of our traders by the Ladak officials. The recognised duties were so heavy as to become prohibitive, and yet they were mild compared with the illegal cesses extorted by the officials. Whilst I was passing through Lahoul the Maharaja's agents were going from village to village, levying tribute from British subjects for the benefit of their master.

"Beyond the Cashmere border we knew little of what events were taking place, beyond the fact that the Mahomedats had cast off the Chinese yoke, and with it all commercial connexion with the East, and their necessity was evidently our opportunity; but beyond this one encouraging fact, there was little to oppose to the opinion expressed by many that the idea of opening out commerce with Central Asia, by such a line, was purely chimerical.

"Within the short space of two years, however, everything has changed.

"At a comparatively insignificant cost,—not more than 500*l.* having been expended up to the present time,—the road from Kulu to the Ladak border has been rendered passable for laden animals. Rivers have been bridged, steep ascents have been reduced to easy gradients; and for another sum of 500*l.* the whole road will be rendered complete.

"The tribute paid to Cashmere has been abolished; duties have been reduced; oppressions and exactions by Ladak officials have been abandoned; instead of the former system of impressing porters without payment, now, thanks to the Maharaja's liberal orders and to Doctor Cayley's watchfulness, full hire is paid to every man for his services. Joy and gladness now reign throughout Ladak, and the utmost content and gratitude are expressed by the numerous traders to be met with on the road.

"Moreover, instead of being met with opposition by the Maharaja's agents, and with gloomy forebodings as to the destruction of Cashmere monopolies, we now have the Maharaja and all his agents fully alive to the advantage of

free-trade, and each vying with the other in endeavouring to foster and extend the trade which they so lately tried to stifle.

"From Yarkund and Kashgar the traders and travellers bring encouraging accounts of tranquillity and a vigorous Government under Yakub Beg Kooshbegoe. And all unite in expressing the earnest desire of the ruler and his people to see trade with Hindostan fully developed.

"Arrived at Leh, it was surprising to observe the crowded state of the bazaar, and the piles of goods brought from Yarkund, Cashmere, and the Punjab, heaped up in the houses or in the court-yards behind.

"Leh is in itself an insignificant place—the chief town of a sparsely populated and poor country, which can maintain little or no trade. But it is important as being the entrepôt of commerce between distant countries, of the vigorous vitality of which ample proof is afforded by the evidence of one's senses.

"The return of imports and exports about to be furnished by Dr. Cayley will show the state of the market at the present time. It is admitted that the bulk of this season's merchandise is yet on the road, and as yet the news of the measures taken to facilitate commerce have not been made fully known. Still, it may be noted as a satisfactory commencement that the amount of transactions this year will be about double that of last year.

"This trade is now to be stimulated by the establishment of a fair at Leh in the autumn of every year. And to make this a success it was necessary to arrive at some computation of the demand and supply of the different articles. Time alone can adjust the market properly, but experience of what occurred in establishing the Palampur Fair taught that, in order to guard against disappointment and loss, it was necessary to make and publish some kind of estimate of the articles most likely to be in demand.

"A meeting of traders therefore was held to discuss commercial matters. The conversation was first directed to the road by which Yarkund and Turkestan are generally supplied with goods.

"It appears from the statements of traders, that of late years English goods have been sent in large quantities by Dera Ismael Khan and Peshawur to Bokhara, and thence by Kokan to Kashgar and Yarkund, and have competed successfully with goods brought from Russia. It will be observed, by a glance at the map, that commerce thus takes a very circuitous route, double the time being consumed on the journey which would be taken by the direct route.

"The reason for this which would naturally suggest itself to one's mind is the unfavourable character of the road over the Himalayas, and this was assumed when inquiry was made of the traders. But it is a fact worthy of notice that they all at once replied, in an emphatic manner, that the cause of the stoppage of trade, by the direct route, was solely the excessive levy of duties by the Cashmere Government. As proof of this, they pointed to the presence in the meeting of many traders who never came to Leh before; but who had now been induced to venture by the announcement of a reduction of duties.

"There was no inclination to make light of the difficulties of the road, but they declared that this would not hinder trade if the fiscal burden were lightened. This fact is important, and gives encouragement; for, as will be shown presently, there is every prospect of our being able to improve the road greatly.

"They next pointed out as a hindrance the difficulty of getting carriage. Owing to the smallness of the traffic along this line, no attempt had been made to provide animals for burden, beyond what could be obtained from the neighbouring shepherds or landowners. A few men at different places kept

ponies and yaks for hire; and as the supply was limited, not only could the prices be unduly raised, but often great and vexatious delays would be caused by enforced halts till animals which had carried onwards a previous batch of merchandise could return.

"Between Leh and Umrtsur merchants have to change their carriage five times.

"Now, on the Bokhara and Kokan line it was represented that owing to the wealth of the traders and the greater traffic, no such difficulty exists.

"But this is an evil easily remediable. It is quite evident that, it having been once determined to give a stimulus to trade, it will be worth while for carriage owners to increase their supply. All that is requisite is some kind of guarantee that if more cattle be put on the line, the trade will be sufficient to employ them all.

"Wuzoor Goshoon and Tara Chund at once agreed to take up the subject as regards the road through British territory, and have already commenced arrangements by which carriage will be more plentiful, and cheaper.

"The discussion was then turned to the state of the road between Ladak and Turkestan. Hitherto only one line has been used, which crosses the Karakorum range, and is so exceedingly dangerous and difficult that the traders are obliged to take three spare horses for every one laden, and the calculation is that 25 per cent. of the animals die on the road. The hire of a horse-load for the journey varies from Rs. 42 to Rs. 50. This of course increases the cost of freight enormously. Yet all this difficulty and expense has not prevented the trade from doubling itself this year—the real obstacle, excessive duties, having been removed.

"Similarly, though in less degree, the road between Leh and Hindostan has hitherto been somewhat dangerous and difficult, yet there is a large class of the population of Bussahir, Lahoul, Chumba, and the lower hills, whose living entirely depends on this trade.

"For these persons the improvements now being undertaken by the British Government will render the road so easy that it is hoped that a reduction of 25 per cent. in the cost of carriage may be made.

"As regards the Central Asian trade, it is a matter of the greatest importance that the route which two years ago was pointed to when the subject was first broached, as most likely to prove perfectly easy for laden animals, has now been pronounced by Dr. Cayley, who has travelled over it, to be thoroughly practicable even for laden camels. By the Changchenmo route all the difficult passes of the Karakorum are avoided. Instead of having to march for six days consecutively without finding a blade of grass for their cattle, as over the Karakorum, the traders will find grass, wood, and water, in abundance along the Changchenmo line. Three places only are without grass, and these are not at consecutive halts, so that fodder can be carried without difficulty for one stage where necessary. Thus the towns of Yarkund and Khotan can be reached without any risk of life or injury by an easy undulating road as quickly as by the difficult and inhospitable Karakorum route.

"It is often said by persons not accustomed to travel in these high regions that it is impossible for trade to pass with any ease over such high elevations as 18,000 or 19,000 feet. But the best answer is experience and fact. Trade not only does pass by these routes, but shows a tendency to increase.

"The fact is, that mere elevation within certain limits is no obstacle to progress. When the traveller has reached the plains of Roopshoo or Ladak, he is already at a great elevation, perhaps 15,000 feet. The passes above him do not rise more than 2000 or 3000 feet, and the ascent is generally over an easy slope.

"It is well known that, though four passes have to be crossed between Kulu and Leh, the only one of which traders speak with any fear is the lowest,

the Rohtung. This pass is only 13,000 feet high, but owing to its vicinity to the rainy tracts of Hindostan, its sides are washed by frequent rains into deep ravines, or are carried away by constant avalanches of snow. As we travel further north, and escape the influence of the rains, we find but little snow lying on the passes, and there being less action on the soil, the mountain slopes are scarcely ever cut into ravines.

"The consequence is that from the Bara Lacha Pass to the Changchenmo, the passage over the mountain rising as high as 19,000 feet is only the surmounting of a succession of vast undulations, which offer no obstacle to enterprising traders.

"I may perhaps be asked how, when such an easy road exists, it has never been used. No satisfactory answer has as yet been given, beyond the assertion that for many years the route was forbidden by some former ruler of Ladak. Anyhow, whatever be the reason, we have now only to deal with the fact that the route, though practicable, was closed till now. Whilst I am writing this, a trader, who has ventured over the road, points out a still shorter route for a portion of the way, by which two days' march may be saved; and doubtless if proper persons be employed to survey the whole line, most satisfactory results will be obtained; meanwhile the Yarkund Vakeel, accompanied by a party of Punjab traders and horse loads of Kangra tea, is about to take the Changchenmo route to Yarkund, and thus open the line for future caravans.

"If negotiations were opened with Yakub Beg Kooshbegoe, he has the power, and we are assured has also the will, to secure the direct route by Kogyar to Yarkund from the depredations of the Kunjotes robbers, thus rendering a still shorter line available for trade.

"There is another route between Yarkund, Khotan, and Hindostan, which, passing through a corner of Chinese Tartary, impinges on the Hindostan and Thibet road. This, if opened out, would be still more favourable than the Changchenmo route. But this road can only be opened by a negotiation with the Peking authorities."

As an instance of the great change in trade that would be effected, take the article of tea. At present the tea was brought down from the interior of China to Shanghai and Canton, and there shipped to India. From Bombay it went to Kurrachee, and from Kurrachee up the Indus into the Punjab, and by the Khyber Pass into Cabul, and from Cabul to Kokan, thence south-east to Kashgar, and from Kashgar it was disseminated through Central Asia; whereas, if the proposed route were opened out, the tea from Assam would come almost direct. Instead of making a circuit of 5000 miles, it would pass over about 500 miles, from Assam through Thibet straight into this very country of Khotan, Yarkand, and Kaahgar. The last route to which Mr. Forsyth referred was that which goes round the Karakorum on to the great table-lands in the north-east corner of Little Thibet. From Leh it passed along the Changchenmo valley as far as the River Karakash, so far being the same route as Mr. Johnson followed; the difference afterwards being that Mr. Johnson crossed the Kuen-lun from the head-waters of the Karakash to the town of Ilchi, whilst Mr. Forsyth's route turned off to the left, following the banks of the Karakash all the way to Ilchi.

This was a classical road, because it was the very one described in 'Lalla Rookh,' by which the prince passed from Delhi to Khotan in search of his lady-love. So there was really nothing new in it except the connection which Mr. Johnson's survey enabled us to make with other routes. Mr. Forsyth gave calculations, obtained by actual investigation from the merchants, of the enormous profits made on the export and import trade by this route, with all its present disadvantages. On piece goods it is 50 per cent.

So far for the information supplied by the Report of Mr. Forsyth. He would now give some account of the communications received from Mr. Hayward. This gentleman had volunteered to go out for the purpose of exploring the country between Hindostan and the plains of Central Asia, at his own risk and on his own responsibility. He received some small pecuniary assistance from the Geographical Society by way of outfit; but he was not an officer of the Government, and he would deserve all the more credit if he came back with any great geographical results. Departing in July last from England, he proceeded, on arriving in India, in the first instance, to the vicinity of Peshawur, which would be the natural starting-point for traders leaving British territory. Hitherto the route had followed the high road by Jellalabad to Cabul, and across the Hindu Kush to Kunduz, thence by a circuitous course to Khotan and Kashgar. But it has long been known that there was a direct route from North-Western India to Turkestan. This was brought prominently forward in an article in the 'Quarterly Review' two or three years back, and the authorities for it were then given. But no authentic account of this route had been given by any English traveller. Captain Raverty, a very intelligent and industrious officer, who was a long time stationed at Peshawur, collected a great deal of information concerning the route, which he published in the Bengal Asiatic Society's Journal. Besides this, there was a gentleman still living who, it was believed, had personally traversed all these regions,—a Colonel Gardiner, in the service of the Maharajah of Kashmir. Some day he might, perhaps, put all his experience into writing for the benefit of the world; but at present we only knew of him by report. With the exception of Raverty and Gardiner, he was not aware of any person who had ever travelled along this direct route. It was possible the boy lost among the Afghans, whose adventures were published, some time ago, for the edification of the reading public, might have been there; but if he was, he had left nothing worthy of record. Then, again, there was Captain Laroon, who had travelled a great deal about that country, and might also have traversed portions of this route; and Mr. Hayward had been in the vicinity, but not

actually in the valley. In 1842 he himself remembered riding with a party once to the bank of the river at Jellalabad, for the purpose of examining some remarkable Buddhist antiquities, and they were then exactly in front of this great valley, which opened out on the river near Jellalabad and ran right up into the heart of the mountains. The people on the spot told him, "This is the gate of Turkestan," it was so well known in the country to be the really natural access from the low country of the valley of the Indus into the great plains of Central Asia. Although we made several attempts during our occupation of Afghanistan to penetrate into that valley, we never succeeded beyond a very short distance; and up to the present time he believed no European had ever been up there, at any rate we had no account of it. Mr. Hayward's special object was to traverse this valley. Owing to local circumstances, when he arrived there he found it impossible to carry out that plan. But he had obtained the very best substitute for personal observations: he had obtained a very elaborate itinerary of the route from a Yarkand merchant, who had been in the habit of following it, who seemed to have been a very observant traveller, and who put down in detail all the physical characteristics of the route; from that Itinerary Mr. Hayward had constructed a very excellent map. He held in his hand the Itinerary translated into English. This great natural route, which, it was asserted, was practicable throughout to laden carts—he believed there was no other pass over the mountains between India and Central Asia which was at all in the same category—this direct route passed from Jellalabad up the valley and along the river up to its source; and from this point by a very easy road over the Hindu Kush, the Chitral Pass, into the valley of the Oxus. Once there, your difficulties are over. There were other roads into the Chitral Valley from Peshawur, without proceeding to Jellalabad; one by the Swat Valley, and another by Bajour. The great matter was to reach the Chitral Valley, by which the readiest access was obtained over the lofty mountain-range into the valley of the Oxus. Two passes over the Hindu Kush were described in the Itinerary: one, north of the town of Chitral, the "Kotah Darah," which was the more difficult route; the other straight up to the head of the Chitral Valley, much the more easy, and, as stated in the Itinerary, practicable for laden carts. After giving all the stages of the route in detail up the valley, until the pass at the top of it is reached, the author said:—

"At the pass is a hot spring and a lake, which is at times closed by avalanches from the pass two or three years continuously, after which it bursts forth in a torrent that rises in the pass and runs about a mile to the west of the lake. The boundary of Chitral ends here."

He went on to describe several fertile tracts in the upper valley of the Oxus—fertile for a limited population, but not by any means favourable for the march of an army.

In connection with the valley of the Oxus, he must call attention to a subject of very great interest with regard to this Itinerary. The route from Western Asia to China, through Persia and along the north of the Hindu Caucasus, had been a great route of commerce from a remote antiquity. It was laid down by Ptolemy and all geographers since his time, but never with any minuteness. In the middle ages, Marco Polo travelled by it; after him the only traveller who ever described it in any detail was the Portuguese missionary, Benedict Goetz. The route of Goetz had always been a difficult subject of investigation. Colonel Yule, who had studied the subject of mediæval routes overland to China, and had recently published his inquiries in two volumes, entitled '*Cathay, and the Way Thither*,' was always puzzled by it. In short, we should never have been able to understand it without such recent information as that afforded by this Itinerary obtained by Mr. Hayward. The Yarkand merchant travelled along the same road as Goetz, following the route, stage by stage, and the identifications of places throughout were placed beyond doubt. The names of the places which occur in Goetz and in this Itinerary were quite sufficiently similar to establish the identity of the route.

Sir Henry Rawlinson said he would conclude his observations on this important geographical document by reading Mr. Hayward's remarks upon it:—

"As these routes are taken from verbal information, supplied to the Punjab Government by a Yarkand merchant, I believe they are to be relied on, in so far as the general description of the roads and countries is given. But the distances are not reliable, nor can the accompanying rough map be considered so, speaking geographically. If, as is stated, the pass at the head of the Chitral Valley is so easy that laden carts can traverse it, this route must then be considered as not only the most direct road from Peshawur to Yarkand (and Badakshan), but also as the easier for trading purposes. Pundit Munphool, however, states 'that the trade through Chitral is confined to certain adventurous Afghans alone, and that natives of Yarkand seldom traverse this route.'

"The road being subject also to incursions of the Kafiristan tribes, is, perhaps, on that account avoided by the Yarkand merchants, who prefer the longer route via Kashgar, Kokan, Bokhara, and through Afghanistan, or through Ladakh and Kashmir.

"In conversation with a Moonshiee, by name Mahomed Huseain (and who accompanied Pundit Munphool to Badakshan), I learn that the Chitral Valley is well cultivated, great quantities of rice and Indian corn are grown, and it is thickly inhabited. The Khan of Chitral also professes favourable views towards the Indian Government. He, however, carries on an extensive slave-trade with Badakshan. The Sir-push Kafirs of Kafiristan, kidnapped or forcibly seized by him from the adjacent country of Kafiristan, also persons of the Kalash Dangi and Bashgali tribes, idolaters living in the Chitral territory, people of the Sherah sects who are convicted of any crime, and the children of

culprits from these classes, are all sold by the Chitral ruler to the Badakis, Uzbeks (of Uakhan), and Shighnis (of Shighuan), by whom they are taken to Bokhara and Eastern Turkestan. The price of slaves in Chitral varies from 25 tillas (about 15*l.*) to 12 tillas (about 7*l.*)."

A Report had also been received by the Society, furnished by Munphool Meer Moonshee, a pundit who served as an agent sent by the Government into these countries. He had described them pretty much in the same terms as the merchant whose Itinerary had been copied by Mr. Hayward. He showed that the reason why this route was not generally followed was on account of robbers among the hill-tribes. It was curious to find that the tribe which committed the greatest atrocities were called the Atkash—the very tribe who attacked Benedict Goetz. That very tribe, who at present held the passes and attacked travellers, were described as having blue eyes and light hair, exactly as Benedict Goetz remarked of those Atkash robbers who attacked him.

If Mr. Hayward succeeded in reaching Yarkand and penetrating into the Pamir Steppe, he would be doing great service to science; for, as Lord Strangford would be able to explain, the geography of that part of Asia had been confused and mystified beyond all conception by a very singular network of ingenious forgery or romance. It certainly was the case that both English and Russian geographers had had to contend, for many years past, with a fabulous system of geography in reference to these regions. There was a certain paper in the archives of the Russian Government which had been followed by all Russian geographers; and a certain voluminous document was also in the archives of the British Government, which many years ago had been submitted to the elder Mr. Arrowmith, and served as the foundation of that part of his map of Central Asia, which had been considered as a standard authority. Both these documents were utter forgeries; the product of the ingenious imagination of a clever man—a man well acquainted with the subject, but who invented the Itineraries and actually extemporised a system of geography. The Russian document was stated to be the *Travels* of a certain Georg Ludwig Von —, supposed to have been a doctor in the English service, who was sent out into Central Asia to buy horses in a region where there was no possibility of getting horses. The manuscript volume which we had in the Foreign Office was supposed to be the journal of a Commission sent by the Emperor of Russia to survey our frontiers—a commission which never had any existence. Thanks to this Itinerary, we were now able to expose the whole thing and to test the authenticity of these *Memoirs*.

Sir Henry Rawlinson concluded as follows:—

And now, sir, although I entirely approve of the rule which excludes from our deliberations all discussion on political matters, I cannot avoid saying a few words on the Russo-Indian question; because a misconception, as I think, of the true bearing of this question has given rise to much of that discouragement with which we have hitherto had to contend in pushing our trade and geographical exploration into Central Asia. Let me say, in the first place, that I entirely agree with a late writer in the 'Edinburgh Review,' that the wildest Russophobic could never contemplate danger to India from beyond the chains of the Kuen-lun and Karakorum (to which I would also add the Hindu Kush). Although the routes over these chains, to which I have already drawn attention, may be perfectly practicable for commerce, they are quite impracticable to the march of an army, not on account of physical difficulties, but from the want of supplies; and the best practical proof of this is that in all history there is no instance of an invader having ever attempted to descend upon India, either by the Pohn or Changchenmo route from Eastern Turkestan, or by the Chitral route from the valley of the Oxus. No, sir, if in the fulness of time Russia ever does attempt an approach to, or a demonstration against India, her line of advance will not lie over any of the passes of the great Northern Range of the India Caucasus, but it will follow what might be denominated, in the language of mathematicians, the line of the least resistance, which runs from the south-east corner of the Caspian, by Meshed, Herat, and Candahar; and, in reference to that line, I will only further say, that so long as we preserve our present friendly relations with the Persians and Afghans—so long, that is, as we all offer a combined resistance—any such military advance is simply impossible. But, sir, to consider the general question, let us take the French alliance for an example. Now, there is certainly a possibility that, under very exceptional circumstances, the French at some future period may attempt an invasion of this island; but does such a possible remote contingency in any way affect our relations with that power? Do we not in the mean time maintain the closest alliance with the French, political and commercial? And why, then, are we to be deterred from meeting Russia fairly and frankly in Central Asia, merely because in the time of our children, or our children's children, under some equally exceptional circumstances, we may be engaged in hostilities with that power, in the course of which she may find it expedient to make a demonstration against India? No, sir, do not let us any longer be deterred by a fear of entanglement with Russia from pushing our legitimate trade into the countries intermediate between Russia and India. If Russia has her Consuls established for the protection of her trade at Kokan, at

Kashgar, and at Kuldja, let us also have our Consuls settled at Ilchi, at Yarkand, at Balkh, and at Herat—at all the great outlets of our commerce with Central Asia. I can see no reason, indeed, why the Russians and English should not go on, hand-in-hand, in developing the trade and resources of the countries intermediate between the two empires. The sooner, at any rate, that we can remove the mutual mistrust and reserve which has hitherto hampered commercial enterprise and checked geographical discovery, the better; and this Society, which from its numbers and intelligence has now become a power in the State, may very materially aid the good work by the expression of its views in its favour. I trust, therefore, that if any discussion arises on the points which I have brought before the meeting, this practical result will be kept steadily in view.

The PRESIDENT, in returning thanks to Sir Henry Rawlinson, said he entirely coincided in the sentiment which he had put forward in the last sentences he had read. He would now call upon Lord Strangford to offer his observations.

LORD STRANGFORD addressed himself more particularly to the remark of Sir Henry Rawlinson,—that there is a true and a false geography of these countries. The true geography had grown piece by piece, in a way that was highly satisfactory to contemplate. It may be said to have had for its first beginning in modern and scientific times, the well-known Itinerary of Izzet Ullah, despatched on special service of inquiry by Moorcroft, taken together with the map of Lieutenant Macartney, at the end of Elphinstone's work, which was based on an examination of all records in India accessible at the beginning of the century. From that period down to this very last Itinerary the successive authorities on this subject mutually corroborated one another in even minor details, and are nowhere in any material opposition. We had now come into possession of excellent itineraries; we had obtained a correct and comprehensive general scheme of the whole country between the head-waters of the Oxus—a country perhaps more easily defined hydrographically than in any other way. Roughly speaking, this consists, working from east to west, of the Gilgit River, the branches of the Swat River, the long Chitral Valley, the streams of Kafiristan tributary to the Cabul River, and, north of the mountains, the various feeders, great and small, of the Oxus. The narrative of Captain Wood is unquestionably the chief and most classical account of this region, as he personally visited the very heart of it. By the side of it may be ranked, as establishing fixed points in a district which is the least visited of all, the recent narrative and Itinerary of Abdul Mejeed, the meritorious Afghan Mollah, on whose behalf, it is to be remembered, he (Lord Strangford) had received the award of a gold watch two years ago. As a third classic record of fixed points must be taken the important series of papers contributed by Captain Raverty from native information, giving a fully detailed account of the Chitral Valley, the Swat Valley, and, lastly, of that unknown, but most fascinating, region which ethnologically was the most interesting of all, the country of the Siyah Pūsh Kafirs,—infidels who had so surprisingly maintained their independence against the surrounding swarms of Mahomedans, the men with blue eyes and fair hair, who used chairs and tables, and were supposed to be descendants of the Bactrian Greeks. By the side of all this result of genuine work, we have geographical names and positions on our maps which no one has ever found in the countries themselves, and which there has hitherto been no way of accounting for. Sir Henry Rawlinson had given, in his brief sketch, the essential outline of this. He had already exposed the

extraordinary story of the German Baron Ludwig Von — two years ago: a story not only spurious, but absurdly so, when brought to the test on ground, like Cashmere, fully within our own geographical competence to speak positively. Now, meditating upon this, he happened to fall across a note in the 'Quarterly Review,' to the effect that there existed in the archives of our Foreign Office a memorandum in manuscript on Central Asia by the late Julius Klaproth, containing a whole mass of geographical and miscellaneous information. He applied to Lord Stanley for permission to see this manuscript. On examining it, as yet only with special reference to the Baron, he found, bound up with this manuscript, a map which contained Kashmir as its centre, in which the whole scheme of the geography of Kashmir, and the fictitious local nomenclature of Kashmir, were given exactly as they are in the hypothetical Pamir's map. Now this proved, of necessity, either that Klaproth had access to the Russian archives, from which the Baron's memorandum was disinterred by Veninokoff in 1861, or else that Klaproth was the actual fabricator of that book himself, and so was himself neither more nor less than the Baron. In the paper introducing the Baron's story, translated and printed in our 'Journal' for 1866, it will be remembered that Veninokoff described his having made another simultaneous discovery—the discovery of a Chinese Itinerary passing through the very same region, more or less, and drawn up with great elaboration, presented to the Russians by the same Klaproth. Now, as far as the names from this came out through the above and the later papers of Veninokoff, they were identical with the names contained in the manuscript of Klaproth. That manuscript, as beheld in the form which the Foreign Office acquired, purported to be the personal narrative and the geographical results of a Russian expedition, which was sent into Central Asia as far south as our Indian frontier by the Emperor Paul, about the year 1801 or 1802. So that, in point of fact, the result of the examination was that the geographical matter given by Klaproth to the Russians as Chinese, was given by him to us as the result of an alleged Russian expedition by the Emperor Paul. He was not going into the details of this parallel for the present, it was sufficient to state the general result. These Russians went, first of all, to the city of Ili, from Ili to Yarkand, from Yarkand south by a road which does duty for the Karakorum Pass, but which is cast in an altogether different mould. This last was entirely fabricated, and would be exposed, he hoped, on a future occasion by himself. By this way they got down to Dingang, a large town on the River Gher-Sind, thence along this ingenious double of the true Indus over a watershed in one or two days' march through the country of the pagan Siyah Pôsh to the head-waters of a river called Santadrin, flowing into the Badakshan branch of the Oxus, and then by Dairin, Bolor, Egra, and divers other strange places, which are either something quite different from the assigned position, or else are nothing at all. Lord Palmerston gave permission to Mr. Arrowsmith to study this manuscript for geographical purposes in 1834; and Mr. Arrowsmith thus came to embody in his own map some of these erroneous or fictitious positions, which have in this way obtained standing-room on subsequent maps. He was not, of course, to be blamed for doing so. But those positions had ever since occupied a certain place in our maps. They had only been slowly and gradually eliminated in our recent maps, more particularly the map of Colonel Cooke at the War Office, and the map of Colonel Walker at Calcutta, who, it may be said incidentally, had been the first to give the proper position and dimensions to the great Pamir upland, and had naturally eliminated most of these false positions, by dint of not finding any vouchers for them anywhere. But in the latest map of Petermann, and elsewhere, since this old matter turned up anew in the shape of fresh Russian discoveries, they had regained their footing in continental maps, the Russians not being aware of the circumstances in which they had first made their appearance, or of the fact that Klaproth had presented himself in two distinct characters to the Russian and

the English authorities. The date of our receiving it was at the time when Canning was Foreign Minister in 1824. He would now briefly read the heads of his general conclusion upon the subject :—

1. That the geographical matter, represented in the Klaproth MS. as having been acquired through a Russian survey, is identical with that exhibited in the memoir recently discovered at St. Petersburg by Veninkoff, purporting to be a Chinese Itinerary translated and contributed by the same Klaproth, in so far as the latter has been made public.

2. This geographical matter is altogether spurious in the journey from Yarkand southwards and round through Bedakshan to Kokan.

3. The map of Macartney seems to have entered to some extent into its fabrication, and certainly formed the actual groundwork of the parallel falsification of the hypothetical Baron Ludwig von —, as far as the neighbourhood of Cashmere is concerned.

4. A map of Klaproth's own construction, bound up in this volume, being independent of the above Russian expedition, represents Cashmere under the nomenclature and conformation of the Baron. This circumstance proves either that Klaproth had access to the Russian archives, from which the Baron's tale has lately been recovered in an unspecified way, or that he actually fabricated it. This last view is in some measure supported by the philological similarity between the two sets of fictitious names which have the same aspect, just as the local names in 'Gulliver's Travels' have the same philological air.

5. In criticising this paper, no margin can be left to the score of uncertain knowledge, as its geography claims to be the fixed result of actual *bona fide* observation along the whole line of travels. It is fair to assume, however, that Klaproth did believe himself to be representing the general state of the country in so far as he knew it, and that he only knew himself to be falsifying, or rather mystifying, when he employed fictitious machinery for his knowledge by conveying it in the dramatic form of the narrative of a Russian expedition.

They would see by this that, thanks to the liberal permission accorded him by Lord Stanley, he had brought down two birds with one stone—the sham Baron's narrative, and the sham Itinerary of the expedition, which is also a Chinese Itinerary: this last, possibly, having a genuine Chinese groundwork, but, at all events, asserting false geography when within the scope of our knowledge.

THE PRESIDENT: Also your belief that the Russians did never send an expedition?

LORD STRANGFORD really had no means of knowing whether the Russians did or did not send an expedition; but, as he took occasion to mention to Lord Stanley, in regard to the Emperor Paul being capable of having sent one, it was known as a matter of history that he was at one time on bad terms with ourselves, and that the Russians did certainly try at that time to feel their way as much as they could towards India. Consequently there could be no delicacy in adverting to the then state of things, especially as it was doubtful, as matter of fact, whether the Emperor Paul did send any expedition or not. In conclusion, his Lordship said he hoped he should soon be able to read a paper on the subject.

THE PRESIDENT observed that Lord Strangford should have a whole evening to himself on this most important subject. He then requested Sir Bartle Frere, late Governor of Bombay, to say a few words upon the general subject of the trade-routes.

SIR BARTLE FRERE said, after having listened to two such great masters of the science of Geography as Sir Henry Rawlinson and Lord Strangford, at that late hour of the evening it would rather be a work of supererogation to attempt to add anything to the information they had given. They had lifted a corner of the veil which had so long concealed the truth concerning these regions.

He thought we should all go to bed content to have learned one great truth this evening—that it is in the power of a falsehood in science to keep asunder great nations, and that it is in the power of men of science and literature to remove that misapprehension, and to bring great nations together.

A second Paper was the following:—

2. *A Journey to the Western Portion of the Tian-Shan Range, from the Western Limits of the Trans-Ili Region.* By N. A. SEVERTSOV. Translated from the Russian by ROBERT MITCHELL, Esq., F.R.G.S.

This Memoir will be published entire in the 'Journal,' vol. xxxix.

Second Meeting, 23rd Nov., 1868.

[Held in the Theatre of the ROYAL INSTITUTION, by permission of the PRESIDENT and MANAGERS.]

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT, in the Chair.

PRESENTATIONS.—A. T. BOWSER, Esq.; Henry Blanc, Esq., M.D.; Lieutenant W. F. Pridemanz.

ELECTIONS.—Henry Blanc, Esq., M.D., &c.; William Bowly, Esq.; Henry Bright, Esq.; George Phillips Bean, Esq.; the Hon. Felix Bedingfield (Colonial Secretary, Mauritius); William Clarke, Esq., M.I.C.E.; Lieutenant Thomas Tupper Carter, R.E.; Alexander Croll, Esq.; A. A. Hay Currie, Esq., C.E.; William Pirie Duff, Esq.; John Douglas, Esq.; Captain William H. Mailland Dougal, R.N.; George W. Davidson, Esq., M.A., M.D., &c.; Rev. Allen Thomas Edwards, M.A.; Lieutenant-Colonel G. M. B. Farquharson; Alexander Frater, Esq. (First Assistant in the Canton Consulate); Richard Henry Glyn, Esq.; Lieutenant Thomas Hungerford Holdich, R.E.; James Lawrie, Esq.; Robert P. Linton, Esq. (Surgeon-Major, H. M. Indian Navy); James L. Lobley, Esq., F.G.S.; Robert McLaren, Esq.; Major F. A. Millingen; Lord Ormathwaite; Thomas S. Owen, Esq.; Lieutenant W. F. Pridemanz (Bombay Staff Corps); Henry Rose, Esq.; Major-General Sir Charles Staveley, K.C.B.; Major Robert Murdoch Smith, R.E.; M. J. de Salles; Charles Henry Walker, Esq.; Rev. Thomas Whitby, M.A.; Richard Henry Wood Esq., F.R.S.; Captain John Wood (late I.N.).

ACCESSIONS TO THE LIBRARY FROM NOVEMBER 9TH TO 23RD.—*Donations.*—'The Parana: Incidents of the Paraguayan War, &c., from 1861 to 1868.' By T. J. Hutchinson. Donor, the author. 'Compte-Rendu à propos de la Guerre du Paraguay.' Par M. Hutchinson. Donor, the author. 'The Non-Aryan Languages of India and High

Asia, 1868.' By W. W. Hunter. Donor, the author. 'The Valpelline, the Valtournanche, and the Southern Valleys of Monte Rosa, Surveyed in 1865-6, by A. Adams Reilly.' Donor, the author. 'New Mexico.' By C. P. Cleaver, Washington. Donor, the author. A Collection of Papers relating to the Gold-fields of Southern Africa. From J. Robinson, Esq., Natal. 'United States' Coast Survey, 1864, 1865.' Donors, the Secretaries of the United States' Navy. 'British Burmah and China Route Survey for 1867.' By Captain J. M. Williams and Captain C. H. Luard. Donor, Sir A. Phayre.

Purchased.—Norway, Sweden, and Denmark, 1835.' By H. D. Inglis. 'Marocco, 1828.' By G. Beauclerk. 'Almenach du Commerce.' Par Didot-Bottin. 'Atlas Universel d'Histoire et de Géographie.' Par N. Bouillet. Paris, 1865. 'Dictionnaire Universel.' Ditto. 'Voyage to Australia, 1790.' By J. White. 'British Burmah, 1851.' By C. T. Winter. 'Spanish America, 1868.' By F. Hassaurek. 'Ladak, Tartary, and Kashmir, 1862.' By Col. Torrens. 'A Hunter's Diary in the Punjab, Karakorum, 1863.' 'Burmah to Western China, 1868.' By C. Williams. 'Three Visits to Madagascar, 1859.' By W. Ellis. 'East Indian Archipelago.' By W. M. Gibson. New York, 1855. 'Voyages dans l'Afrique, par Le Vaillant.' 3 vols. 4to. 1780. 'Iles Marquises.' Par V. Dumoulin et C. Desgraz. 1843. 'British Guiana.' By W. T. Veness. 1867.

ACCESSIONS TO THE MAP-ROOM SINCE THE LAST MEETING, NOVEMBER 9TH.—Pilot Charts for Atlantic Ocean, on 4 sheets, being part of a series, showing, in a simple and graphic form, the prevailing Winds, Currents, and other Phenomena of that Region. Presented by Captain G. H. Richards, hydrographer. Topographical Plan of the City of Buenos Ayres, on 4 sheets, compiled under the direction of the Topographical Department of Buenos Ayres. Presented by Consul Hutchinson, with 4 MS. Route Maps in the Argentine Republic. Sheet No. 1 of a Map of the Tyrol, on 14 sheets, showing the Political, Statistical, Geological, and Botanical and Zoological Features of the Country. 3 copies, coloured. Presented by the author. Three small Atlases, entitled 'The Middle-Class Atlas of General Geography,' No. 1, 31 Maps; No. 2, 15 Maps; No. 3, 11 Maps. By A. K. Johnston. Presented by the author. MS. Map of Manchuria, to accompany the Rev. Mr. Williamson's Paper. Presented by the author.

* His Excellency SAYYID MAHOMMED BEN SALIM, 1st Envoy; SAYYID AHMED BEN SULAIMAN, 2nd Envoy; HAJEE MAHOMMED BAKUSHMEER, confidential Secretary to his Highness the Sultan of Zanzibar, who are visiting England on a special mission to the British Government, honoured the meeting with their attendance.

The President said he had the satisfaction, in the name of the Society, to welcome as visitors that evening His Excellency Sayyid Mahommed bin Saita, cousin and brother-in-law of his Highness the Sultan of Zanzibar, his Excellency Sayyid Ahmed bin Suleiman, cousin of the Sultan, and also Hajee Mahommed Bakushmeer, confidential Secretary to the Sultan. The Sultan of Zanzibar had been for a very long time known for his goodwill towards English travellers, who had started from his capital to explore the adjacent mainland, and as the supporter of the English merchants who had established themselves in his territories. Lately, through the influence of the Sultan and his Government, great assistance had been rendered to Dr. Livingstone; provisions had been sent to Ujiji, to enable him to carry out the remaining part of the great expedition in which he was embarked. When he stated these facts, he was convinced that the Society would authorize him to request General Rigby, formerly our Consul at Zanzibar, to write a letter in Arabic to their Excellencies, to be presented to the Sultan, thanking him for this great service rendered to the cause which the Society and the British nation had so much at heart. He would add that satisfactory information had been lately received from Dr. Kirk respecting Dr. Livingstone. In all his difficulties he had found sympathy and assistance among the Arab merchants of the far interior, who were more or less under the jurisdiction of the Sultan of Zanzibar. Through their kindness he had been supported for three months while the neighbouring tribes were at war with each other, and had eventually been enabled to pursue his journey.

General Rigby said he had explained to his Highness the kind and flattering remarks of the President regarding the friendship and assistance shown by the Sultan to all English and other European travellers; and he had also explained to him the meaning of the plaudits with which those remarks had been greeted by the audience. His Highness had requested him to say how much pleased he was with his reception, and how deeply gratified the Sultan would be when he was informed of the kindly feeling of this country towards him. General Rigby added that he could add his testimony to the immense assistance which the Sultan had rendered to all travellers. Without his aid it would have been impossible for Burton and Speke, and Speke and Grant, to have undertaken their memorable journeys. He was at Zanzibar when Speke and Grant came there. Nothing could exceed the kindness of the Sultan; he sent them over to Bagomayo in one of his finest ships of war, in order to impress upon the natives that these Englishmen were under his special protection. The territory now under the sway of the Sultan of Zanzibar extended 1100 miles along the east coast of Africa, and comprehended a rich extent of the interior visited by Araka. There was no native state on the coast of Africa that could exercise so vast a power for good or for evil, and upon which so much depended for the future of that great continent, as Zanzibar. It was certainly fortunate that this important kingdom was ruled over by such an enlightened young prince as Sayyid Majid. He had not only assisted all travellers, but had supported all Christian missions, not only the mission of Bishop Tozer but the French mission, which was doing a great deal of good in educating the people; his Highness having always expressed an anxiety that education should be introduced among his subjects. The commerce of Zanzibar had more than doubled within the last four or five years. It extended to the coasts of Persia, the Red Sea and India, and also to the ports of France, Great Britain, and the United States. Two years ago, during the famine on the west coast of India, there were seventy large vessels sent from Zanzibar, laden with rice and grain grown in Madagascar. All our European travellers, especially Baron Van der Decken and Boscher, were indebted to the Sultan for his hospitality and assistance.

The following Paper was read:—

Notes on Manchuria. By the Rev. ALEXANDER WILLIAMSON.

[EXTRACTS.]

SOUTHERN MANCHURIA.—I have paid three visits to this country,—the *first* in the spring of 1864; the *second* in April, 1866, when I travelled from Newchwang overland to Peking; and the *third* this autumn (1867), on which occasion I made two journeys, the one northwards, *via* Hai-Ching and Lian-Yang, to Moukden (called also Shin-Yang), the capital of Manchuria, and the other round the promontory, as far as the Gate of Corea, and visiting every place of any importance both on the seaboard and inland. I am the more disposed to publish these notes as I have found it a country of much interest and great promise, and not that barren, bleak, and lawless country generally supposed.

Surface viewed in reference to its Natural Characteristics.—Southern Manchuria may be divided into two distinct regions,—the one comprising a plain, and the other comprehending an elevated country full of high mountains. A line drawn from Nin-Cha-foo (lat. $41^{\circ} 12' N.$, long. $121^{\circ} 10' E.$) north-east to Shin-Yang, thence south by west, through Lian-Yang and Hai-Chung, to Kaichow and the sea, will divide these two unlike districts, leaving the level country on the south and the mountains on the north and east. The former is an alluvial deposit, extremely fertile, except contiguous to the sea, where that saline exudation so common in the north of China interferes fatally with the productions of the soil. The other portion consists of huge mountain masses, interspersed with fertile and sometimes extensive valleys.

As may be supposed, the character and aspect of these two portions of Manchuria differ very much. The plain is monotonous, and in some places dreary, especially in proximity to the sea; yet it has its charms. Fine crops of tall millet and other grain, large villages with their clusters of trees and a busy population, relieve the eye in summer; and numerous lagoons, covered with reeds and swarming with water-fowl of every description, render it somewhat interesting even at the bleakest season of the year.

Climate.—The climate of Manchuria presents the extremes of heat and cold. In summer the temperature varies from 70° to 90° , and in winter from 45° above, to 10° below, zero. The rivers are generally frozen over by about the 20th November, and are not navigable till the middle of March. The crops grow and come to perfection in a few months, and by the end of October everything is safely housed. The winter generally begins with a snowstorm; after which the weather clears up, and hard dry frost sets in, which con-

tinuous, with the relief of a fall of snow now and then, till the sun asserts its supremacy. This season is very enjoyable; warmly clad, you can scour the country in all directions—marsh, lake, or river, presenting no obstacle.

Rivers.—There are only two rivers of any importance in this quarter of Manchuria, viz., the *Liao-ho*, and the *Ta-Yang-ho*. The former rises in Mongolia, and, after pursuing an easterly course for about 400 miles, turns southwards and pours its waters into the Gulf of Liao tung. Within 150 years large junks used to go up the river as far as the city of Newchwang; but owing either to the accumulation of debris, or, as I am rather inclined to think, in consequence of the rising of the country, they can only now reach the town, called Yang-tsze, where the foreign settlement is, about 20 miles from the bar. Here, however, there is plenty of water for ships of large tonnage, and the river is about 650 feet wide. The tide affects the stream for many miles; good-sized junks can yet ascend to Tien-chwang-tai, and boats as far as Moukden. On the Moukden branch, while small junks can ascend as far as *Tie-ling*, on the main stream, at high water, there is about 16 feet on the bar. The other river rises among the hills, receives a great many minor streams, but especially one from the borders of Corea, flows south-east, and pours its waters into the Yellow Sea. At first rapid, owing to the conformation of the country, it gradually becomes slower as it nears the ocean, and for the last 15 miles of its course is rather an important river. The tide also affects it for this distance, and it is fully taken advantage of for the purposes of commerce.

Chief Cities.—Maikelen (lat. $41^{\circ} 40'$, long. $123^{\circ} 50'$), more commonly called Shin-Yang, or the capital of Manchuria. It lies on the north of the river Shinan, affluent of the *Liao-ho*, and is very pleasantly situated. It is a large city, with high gates; the streets are well laid out, full of good shops. Being the chief city of the province, all kinds of produce peculiar to the country find their way to it, and it is thus an emporium of native goods, the seat of a considerable distributing trade of all descriptions. We found many foreign commodities for sale, such as Russian cloth, Manchester goods, foreign iron, &c., &c. Fur shops, full of fine furs, were found in great numbers in the Great East and West Street. There were also several large book-shops, speaking well for the literary tastes of the people. Kingchu-foo, lat. $41^{\circ} 12'$, long. $121^{\circ} 10'$. This city stands next in importance. It lies not far from the sea, and has a considerable trade. Lian-Yang, lat. $41^{\circ} 18'$, long. $123^{\circ} 10'$; this city, once the capital, embraces within its walls a large area of ground, much of which is now laid under cultivation, chiefly as vegetable gardens. In the centre of the city, however, there are many

large and excellent shops, and there appears to be a good amount of country trade. Hai-Ching, lat. $40^{\circ} 52'$, long. $122^{\circ} 40'$. This city, much smaller in circumference than Lian-Yang, has about an equal amount of business. The shops were well stocked, and the people well to do. Kai-Chow, lat. $40^{\circ} 30'$, long. $122^{\circ} 18'$. This city is more compact than either Hai-Ching or Lian-Yang, and has a considerable trade. Fuchow, lat. $39^{\circ} 50'$, long. $121^{\circ} 38'$. This is a neat, well-built city, but of little importance, except as the centre of some country trade. Kinchow, lat. $39^{\circ} 10'$, long. $121^{\circ} 36'$. Larger than Fuchow, walls equally good; it has about the same amount of business, but is a much less pleasant city. It is washed by the sea, but owing to the character of the coast no junks can trade in the neighbourhood. They accordingly visit the smaller seaports on the south-west, or Ta-lien-wan Bay on the south-east. Siu Yen, lat. $40^{\circ} 15'$, long. $123^{\circ} 18'$; Foong-Whung-Ching, lat. $40^{\circ} 32'$, long. $124^{\circ} 11'$; Newchwang, lat. 41° , long. $122^{\circ} 30'$. These cities possess one important feature in common, and one quite unlike those above described. The former are *bond fide* Chinese cities, within high walls, with good gates, &c.; but these are peculiar in this respect, that the city proper is a comparatively small square enclosure, with a moderately high wall, occupied almost exclusively with the mandarin offices, while all the business is done in the suburbs, which are extensive and regularly laid out. The chief street in the suburb of Siu-Yen is about a mile long, and contains many good shops. It is famed for its finely-veined stones, and many find their occupation in cutting and polishing marble ornaments of various descriptions. Fung-whang-ching has a good country trade, and exceeds Siu-Yen in population and importance. Being nearest to Corea, it has gathered some notoriety as the emporium of Corea goods, and is the first place where the Chinese and Corean officials exchange courtesies, when the embassy from the latter country passes on to Peking. The native city of Newchwang is larger than either Siu-Yen or Fung-whang-Ching, but the suburbs are much less extensive. The place is famous for its excellent water, which is used in the manufacture of spirits, and is also noted for the production of saltpetre.

Seaports.—As might be inferred from the character of the country, there are many seaports of greater or less importance all round the coast, but there are only three of any note. The first and chief is Ying-tszu, on the Liao-ho, where the foreign settlement is established. The main street of this is fully 2 miles in length, the native warehouses are most extensive, and the trade is very large. Junks from all quarters visit it, and the foreign shipping is now considerable. The seaport next in magnitude is Ta-ku-Shan, lat.

39° 55', long. 123° 5'. This town is on the Ta-Yang-ho, and lies about 12 miles from the Yellow Sea. Like Ying-tsze, it possesses many large native warehouses, and is the medium through which an enormous amount of produce from the north is exported. It competes with Ying-tsze in soliciting the trade in pulse and byuncake, but is not likely to succeed. At the same time we met great quantities of goods on the way to this port, which, as far as we could judge, could as easily have been conveyed to the other. There was a great amount of native shipping in the harbour, but chiefly junks of second and third class. Opposite the port the river is about 1100 yards wide, a fine, broad, flowing stream. The tide rises and falls a good many feet, thus facilitating navigation, but the bar is more formidable than at Ying-tsze, so much so that large southern junks find it advisable to discharge their cargoes outside. Like Ying-tsze, the river is frozen over from the end of November till March. Another harbour of some note is that called Pi-tsze-woa, lat. 39° 18', long. 122° 18'. This port is situated on the sea, and the harbour is pretty well defended from winds from all quarters by a series of rocks, which form a semicircle around it. Unfortunately the water is shallow, and many of the junks are left high and dry when the tide is out. This could be remedied by a pier, and it would be worth while to construct one, for this place has the great advantage of being open all the year round. The warehouses here are also large, and the import and export trade considerable.

Population.—T. T. Meadows, Esq., her Britannic Majesty's Consul, who has travelled extensively over the province, and who is now on an arduous journey toward *Tsitsi-har*, estimated the population to be about 12,000,000. Putting one thing with another, I am inclined to think the numbers not far wrong. The population consists of Manchus and Chinese. Originally the abode of the former, they have in a great measure migrated northwards, and the country has been occupied chiefly by immigrants from Shantung. A proportion of the aborigines still remain; in some places as many as one in three, in other places one in ten, and so on in various ratios; but those who have remained behind have invariably settled down either as farmers or in some other definite occupation, and are assimilating themselves to the Chinese in almost every respect. Some few of the more aged still speak the Manchu language, but in addition they all speak the Mandarin colloquial, and the youths are taught from Chinese books in their schools, just as in other portions of the empire. In some places youths are instructed in the Manchu character after they are acquainted with the Chinese, but such instances are rare, and the language is evidently dying out.

The prevailing portion of the inhabitants are thus Chinese, and have introduced all the peculiarities of their fatherland into their adopted country. The population being less dense, the soil fertile, the country new, they have more money to spare than in Shantung and elsewhere on the mainland, and on the whole are extremely comfortable. The head men of hamlets generally club together, and invite over some poor scholars from their native district to instruct their progeny, and thus education is diffused among them as well as in the cities. Year by year great numbers of coolies come over and make high wages as labourers. Some go back carrying their earnings with them, while others invite their families over and settle down permanently. Thus annually they add to their numbers. When travelling among them it was interesting and amusing to find them eagerly enquiring of my assistants, who were from Shantung and Chi-li, where they came from; and if it happened, as it often did, that one or other was acquainted with their native districts, they at once had no end of questions about their kindred and friends, just as old colonists, all the world over, besiege emigrants fresh from home.

Industrial Pursuits.—The bulk of the population is engaged in agriculture and in trades bearing upon that pursuit, such as blacksmiths, wrights, carters, &c. Some are employed in mining operations, and others in fishing, but these are a mere fraction of the population. Cotton cloth and silk are manufactured to some small extent, but that is performed by the farmers and their families in their leisure time. Their crops raised are diverse and important.

Cotton.—This important article of commerce is grown in several places in considerable quantities. The chief producing districts are, first, Kinchu; second, Hai-Ching and Lian-Yang; third, Hyoung Yaou, south of Kai-Chow. The staple is very fair and the colour very good, and it could be grown in much greater quantities if necessary. They plant the seeds towards the close of April, and pluck the cotton in October. They steep the seed in liquid manure before sowing, but this is the sum total of all the labour expended upon it.

Minerals.—Not only is the soil fertile and the crops varied, the country underneath is rich in mineral resources. Coal prevails very extensively in all parts of the country. We found it both in the north and south in common use among the people. One of the chief producing districts lies on the north-east of Laou-Yang. In this locality two places stand out prominently—one called Ma-Kia-Kow, about 60 li, or 18 miles, north-east of that city, and the other, Pm-hi-ha, about the same distance from the former place, in the same direction. Large quantities of coal are mined in these places, and

distributed all over the country. The coal is good and useful for all sorts of purposes. Another producing district lies 90 li south of the city of Fuchow, in close proximity to the coast. Junks can come close to the pits, and thus great quantities are exported, especially to the eastern portion of the province of Shantung. The seams appear to be of great thickness.

Gold.—As might be anticipated, this precious metal is no stranger. It is found in many places towards the south of the promontory, in greater or less quantities; but the most famous district is that on the east coast, to the north of the Pi-li-ho River. Here we passed over gold diggings and a gold-producing country, about 40 miles in length by 10 broad. Last year a serious quarrel arose among the gold-seekers, which resulted in murder, and on this account the mandarins interfered and put an end to the occupation for the present. We also heard of gold at Kinchu, which may be interpreted the "gold-district city."

Those who have followed me so far must often have thought of Canada in comparison with this country. They possess many points of resemblance. A climate similar in its general features, an equally fertile soil, yielding similar crops, and each having a northern territory famous for its furs, each drained by a great river, and possessing a variety of minor seaports. But in some respects Manchuria bears the palm, the climate is a shade less severe, it probably possesses greater mineral wealth, produces cotton and silk unknown in that dependency, and in addition has seaports on the south which are open all the year round. I make this comparison to bring the matter home. How important has Canada been esteemed, and how poor our appreciation of Manchuria!

CENTRAL MANCHURIA.—Extent and Boundaries.—Manchuria may be said to lie within N. lat. 39° and 49°, and E. long. 120° and 133°. These lines embrace the limits in both directions, but the bulk of the country lies like a parallelogram across the map, N.E. by S.W., and measures approximately 800 miles in length and 500 miles in breadth.

I have already endeavoured to give some account of Southern Manchuria, and now add some notes taken during a long journey through the Central and Northern portions of the country. For the sake of clearness and brevity, I shall first give an outline of my route as indicated on the map which I have made, and then speak of the various things which appear worthy of remark, under separate heads.

Starting from Ying-tze, the port of Newchwang, we travelled north-east to Moukden, thence north by west to Fa-Kwho-Mun.

Passing through this Gate we entered Eastern Mongolia, and travelled north by east to Kwan-Chungtze. Here we diverged s. by w. to Petu-Na, and thence eastwards to A-She-hoh.

From this our route lay e. by s. till we reached San-Sing, on the Sungari, the last city in this direction in the Chinese Empire. The Russians have surveyed the river down this length, and have twice or thrice visited this place, so that our explorations and theirs have met and the whole of this quarter of Asia may now be considered as known. Our intention was to proceed from here due south to Ningata; but finding that there was no cart-road,—only a dangerous bridle-path, not even used by Mandarin runners, with no accommodation, and also ascertaining that boats would occupy too long a time, with no population to work amongst,—we were forced to retrace our steps a portion of the way and then proceeded south to Kirin; thence home *via* Kai-Yuen, Tie-ling, and Moukden; having travelled in all about 1400 or 1500 English miles.

The Mountain Ranges.—The chief of the mountain-ranges in Central Manchuria is that called the Shan-ai-n Mountains. Their highest peaks lie on the south-east of Kirin, where they reach the tremendous height ranging from 10,000 to 12,000 feet, their summits being covered with perpetual snow and glaciers. From this point they run north-east and south-west. Towards the north-east they form the watershed of the Hurka and the Usuri, and afterwards the Sungari and Usuri, and towards the north-west they form the boundary of the plain of Newchwang and the backbone of the promontory. These mountains sometimes rise into hills of great beauty and grandeur; as, for instance, in the hills of One-thousand Peaks near Hai-Chung, the hills near Sui-yen, and the range from Fung-Whan-Chung to the Corea Gate. Another range of mountains runs through a portion of Northern Manchuria, enters Central Manchuria about 80 miles east of A-She-hoh, proceeds south by west parallel to the river Hurka—forming a second watershed—then continues its march past Kirin on towards Moukden, where they gradually subside into the plain.

A third range of mountains lies in the Russian territories east of the Usuri and the Amoor. Their highest peaks run parallel to the sea, and not far distant from it; so that the streams which flow eastward are not to be compared in size and volume to those which flow westward and pour their waters into the Usuri and Amoor. This range, as a rule, appears to be higher than those east of it. (These are not to be looked at as single ranges, but rather separate mountain-districts lying in the specified directions, and often forming

mountain masses where the mountains appear to be tumbled about in all quarters.)

The Great Rivers.—Corresponding to the three chains of mountains are three great rivers, the Sungari, the Hurka, and the Usuri.

The *Sungari*, which is by far the most important, both in reference to length of course, volume of water, and extent of basin, takes its rise on the north-western side of the Shan-a-lin Mountains, and proceeds in a direction s. by w., receiving a great many tributaries from the surrounding hills, and sweeps past Kirin—a majestic river.

The *Usuri*.—The river next in point of size to the Sungari is the Usuri. It rises about lat. 44°, receiving numerous tributaries of more or less importance, and after a course of about 500 miles pours its waters into the Amoor.

The *Hurka*.—The third river is the Hurka or the Mootwan-hoh (the River of the Mootwan Flower), as the Chinese call it. It rises about lat. 43°, not far from the source of the Sungari, takes a northerly direction, passes by Ninguta, receives two important tributaries from the west and one from the east, and then debouches into the Sungari at San-Sing. Here, at its junction, we found it almost 200 yards wide, with a good volume of water. At this city we found several small junks from Ninguta, trading with the merchants.

Configuration of the Country.—Judging from the character of the mountain-ranges and flow of the rivers, it appears that the country slopes from east to west, and from south to north—the course of the Sungari River making its lowest point—from which the country again begins to ascend towards the north and west; so that Central Manchuria and Northern Manchuria is just one huge basin, corrugated by several mountain-ranges, with their respective streams,—the mouth of the basin lying towards the north-east.

Climate.—The extremes of climate are more marked than in Southern Manchuria, but by no means so excessive as to interfere with agriculture. The winter begins about the close of October, and ends at the commencement of March, and the other seasons are proportionately narrowed; but the shortness of the time is compensated as elsewhere by the rapidity of growth and maturity.

Cities and Chief Towns.—Kirin is the capital of the province. It is most beautifully situated, more so than any city I have visited in China. It lies at the foot of hills of varying size and contour, which form about three-fourths of a circle around it. The open space on the south is occupied by the Sungari, a fine majestic river, sweeping past it, and then making its way through a valley northwards. Opposite the city it is about 300 yards broad;

and when I was there, it was as placid as a summer lake, and as blue as the sky above, forming a most beautiful contrast with the city and fields beyond.

The city itself is not equal to the situation. Had Moukden such a position it would be a noble place; as it is, the streets are narrow and irregular; the shops low in roof, inferior in style, the best being but second and third rate in character.

NORTHERN MANCHURIA.—Boundaries and Extent.—This province, called Tsi-tsi-har, or more generally Hieh-Seong-Kiang, or "The Black Dragon River Province," by the Chinese, is bounded on the north by the Amoor, on the east and south by the Sungari, and on the west by the Nonni and Mongolia. Its area is 195,000 square miles. There appear to be only two cultivated regions in this province, viz., that in the valley of the Nonni, and along the banks of the Sungari. In the former we have the cities of Tsi-tsi-har (or Sinia-Pu-Kwhe) and Mergen; and in the latter the town of Hu-lan and several villages of greater or lesser importance. The other portions are in their natural wild condition.

We travelled about 90 or 100 miles in this district, on the north of the Sungari, and found villages few, far separate, people sparse, and only patches round their dwellings under cultivation.

The soil appeared excellent, only waiting the spade of the settler to yield an abundant harvest.

In some places prairie ground, dotted with herds of cattle carefully tended, stretched as far as the eye could reach, and at other times mountains rose in succession far on towards the north.

The Future of the Country.—Estimating Liao-tung approximately at 60,000 square miles, Kirin at 135,000, Tsi-tsi-har at 195,000 square miles, this gives an area of 390,000 square miles, or 249,600,000 square acres. If you add to this the country of Eastern Mongolia, which lies in the same latitudes, you have a territory nearly equal to the half of China Proper. Possessed of a good climate, fertile soil and mineral resources, and good harbours—by far the greatest portion of it as yet hardly touched by man—who can doubt but that a great future lies before it? One thing is evident: it is clearly intended to receive and support the overflow of the Chinese population in the north of China for many years to come; and when it is properly opened up, and attention directed to its minerals, it must, together with Corea, rise into one of the most important districts in this quarter of the earth, and play an important part in the history of the world.

The paper will be published *in extenso*, with the author's map, in the Journal, vol. xxxix.

The **PRESIDENT**, before calling for any observations on Mr. Williamson's paper, said it was his duty to call upon the Fellows of the Royal Geographical Society to return their heartfelt thanks to the President and Managers of the Royal Institution for granting the use of the Theatre, in which they were then assembled, for the whole of the present Session. A long period had elapsed since the Royal Geographical Society had assembled within those walls. On that previous occasion his Royal Highness Prince Albert occupied the chair, which was now so worthily filled by his Highness the Envoy from Zanzibar. The Theatre of the Royal Institution had been dignified by the presence of Davy and Faraday in former days, and its high character was still maintained by Tyndall and other distinguished men. He was, therefore, overjoyed to think that the Geographical Society was considered worthy to occupy that room.

With reference to Mr. Williamson's paper, he should first call upon Mr. McLeavy Brown to speak upon it, he having been for eight years attached to the British Embassy at Peking, and having visited various parts of the North of China.

Mr. McLeavy Brown said the paper was filled from beginning to end with information instructive not only to members of the Geographical Society, but also to those who had lived in China. Mr. Williamson's occupation in China led him to travel over the country a great deal; he possessed a singularly calm and just temper, was a close and accurate observer, and had the faculty of recording what he saw in clear and precise language. As an instance of his spirit of research, he might mention that about two years ago Mr. Williamson visited the capital of the province of Shansi in the west of China. About 1500 years ago some Nestorian missionaries from Persia visited China, and planted Christianity there. No trace of these missionaries was found until about a hundred years ago, when the Jesuit missionaries discovered a monument which had been erected in the seventh or eighth century, recording the fact that Christian missionaries had been there. The existence of that monument had been doubted. Mr. Williamson visited the place about two years ago, and found the monument, situated outside the town, in a temple. Although the whole suburbs surrounding this place had been completely destroyed by the Mohomedans five or six years ago, this portion of the temple in which the monument was placed was left standing. He took rubbings of the monument, and sent them to England. With reference to the productions of the province of Shansi, coal and iron were found in abundance, disposed in contiguous layers. The coal was raised from a great depth by perpendicular shafts. In all other parts of China, the Chinese began by attacking the beds where they cropped out, and they followed the various foldings of the strata as they rose and fell. The province of Liao-tung was of considerable importance to us, several of our vessels being employed in the coasting trade, which was thrown open to all the world. The chief things brought from the province were paid for in opium. With regard to the alleged baneful effects of opium, he was not inclined to go so far as Mr. Williamson. It was used by the Chinese much as tobacco is by the people of this country; it was only in exceptional cases that it was smoked to excess so as to injure health. It was a soporific, and taken as a kind of stimulant, pretty much as dram-drinking is in this country. Mr. Williamson had denounced the introduction of opium into the country. It was undermining the morals of the people, and we were responsible for that; and we might trace to that antipathy which has been shown to foreigners during the last thirty or forty years. In regard to the introduction of railways, they would be exceedingly desirable in China; but there were very great difficulties to be overcome. They would interfere with vested interests, they would interfere with the great carrying trade all over China, and with a still greater prejudice which had not to be overcome in Western Europe or America. This was the disturbance of the burial-places of the people. China was one vast

graveyard from beginning to end; the dead in this country are not concentrated in cemeteries, but scattered at convenient places all over the country. The consequence was that round all the cities the country was dotted with little knots of gravestones, which the Chinese prized exceedingly, because the grave was to a Chinaman his only place of worship, and the reverence to departed ancestors the most sincere of their religious feelings. If we made a railway through China we must demolish millions of these graves; therefore, we must expect to meet with an enormous amount of prejudice on the part of the Chinese. Telegraphs and other works of public importance we might introduce; but as to the introduction of railways, that would be a matter of very slow progress.

Sir Hope Grant, K.C.B., said with regard to the opium trade he thought it was one of the greatest blots on our character. He quite agreed with Mr. Brown, that if opium was smoked in moderation it was not deleterious. But the evil was that when once a person began to smoke, he could not relinquish the habit, and the consequences then became injurious. In this way more harm had been inflicted upon the Chinese than by anything which had been introduced into the country. With regard to the question of coal, he remembered, when he was at Pekin, a substance being used which appeared to be a composition of clay and coal, and which burned singularly clear. The seats or beds in the rooms were warmed by fires underneath, lighted from the outside. If these are not lighted very cautiously much discomfort ensued. He remembered one of his staff lighting his fire on going to bed, and falling asleep on his couch. The fire burned merrily, but woke up the sleeper very unpleasantly. As Mr. Brown said, the Chinese did not understand mining properly, the coal was all taken from the surface.

Mr. McLEAVY BROWN said when Sir Hope Grant was in Pekin certain mines in the neighbourhood had not been opened. Two or three years after the Embassy took up their residence in Pekin, they found that the Chinese brought them excellent coal, quite equal to the best Welsh, burning clear and leaving scarcely any ash. He was sent by Sir Frederick Bruce to visit the mines, which he found were situated 60 miles to the west of Pekin, in a valley very difficult of access. The coal was of excellent quality, and was found upon analysis to leave only 2 per cent. of ash. There was a mountain pass to be crossed which could only be traversed by mules. All the coal they used in Pekin was brought this distance of 60 miles on mule-back; the consequence was it cost 45s. a ton at Pekin. The kind of coal spoken of by Sir Hope Grant might be used with advantage as an economical combustible in this country. The Chinese grind clay into a fine powder, moisten it with water, and then mix it with coal dust (such as is wasted in England) in equal proportions. The admixture of clay reduced the combustion of the coal, and allowed it to burn until it was completely consumed, without any smoke coming from it. The coal-dust used was the dust of the anthracite coal. Hundreds and thousands of camels were employed to bring anthracite coal from the neighbourhood into Pekin. In his morning riles he had met as many as 450 camels at a time coming into Pekin, and this would go on every month for months in succession.

The PRESIDENT said, as a geologist, he could confirm what Mr. Brown had said. From an examination of fossils which had been found associated with this coal, he had no hesitation in saying that the coal found in China was of the true carboniferous period, like the English coal.

Mr. LOCKHART said Mr. Williamson was a friend and colleague of his; they had laboured together as missionaries in different parts of China, and more especially at Shanghai. Mr. Williamson went to the promontory of Shangtung, where he had lived some time. His journey in Manchuria was undertaken as an agent of the Bible Society, and, as they had seen by his paper, he was a careful observer of the country and of the varieties of people among whom he

travelled. He was not going to follow Mr. Williamson in his journey, but would rather take up one or two points respecting a part of the country which he had himself visited. The road to Moukden was a fine military road which had its guard-bousses, and which was kept in order to a certain extent. In some districts it was in a state of decay; but it was a large broad road with ferries at the various rivers. He had travelled along it in winter when the thermometer was below zero, and was driven in the carts of the country across wide and deep rivers, the whole of the water being turned into a solid mass of ice. The object of that journey was to accompany Mr. Meadows to the port of Teentsin, who had met with a serious accident while on a shooting expedition. The district between Newchang and Moukden was one extensive coalfield; all that plain, including the plain of Peking down to the south and westward, was one immense coal-field. Had Sir Hope Grant remained in Peking a few months longer, he might have sat by as pleasant and cheerful a fire as he ever enjoyed in these islands. Coal was found extensively throughout this district of Northern China and Southern Manchuria, and some day, when our coals got used up in England, we should find there an abundant supply not only for India, but also for Europe itself. As to the production of gold in these countries, gold-fields were to be found on the eastern slopes of the ridge of mountains to the east of the Usuri River; in fact, along the whole of the east coast, and also in Corea to a large extent. The merchants from Corea brought their gold in carts round to Peking, in about thirty or forty days, where they exchanged it for silk and other products. The promontory of Shangtung was also a great gold-field. Mr. Williamson was the first European who described it. Grains of gold were found by natives many years ago throughout all these regions. And now a great number of Americans and Englishmen had located themselves in the mountains of the promontory, and were digging gold extensively. As they got into the side of the mountains they would find a still larger amount of this valuable commodity. He differed from Mr. Brown in his estimate of the effect of opium upon man. He was a surgeon, and he knew more of the effects of opium upon the Chinese than anyone else, having, during twenty-five years' residence in China, had more than 20,000 Chinese patients suffering from the effects of that drug. It was often taken in consequence of the amount of intermittent fever which prevailed among the Chinese; it was taken to relieve the pain which they suffered. It was then smoked in moderate quantities; but when restored to health an irreparable mischief was done by the habit of smoking which the patient had thus acquired being continued. It was a most injurious and fatal habit,—the most fatal vice that men can fall into. The effect of opium on the individual being far more pernicious even than spirit-drinking. When the habit was once acquired, the temptation to continue it was so strong that the people could seldom shake it off without medical aid. He had calculated, from the quantity imported into and grown in China, that only three millions of the people smoked it to any extent, that was one per cent. of the population. The chief consumption was on the seaboard. We should bear in mind that the evil had the sanction of the British Government, in permitting it to be grown in India and taken to China. It was a crying sin on the part of the English Government to allow such a course to be pursued. But, on the other hand, it should be stated that we did not teach the Chinese the practice of opium-smoking; they taught themselves. Nor was Mr. Williamson correct in saying that we introduced opium into Manchuria. We did nothing of the kind. There were hundreds of miles of poppy cultivation on the Yang-tse-Kiang; there were extensive districts in Mongolia where the poppy was grown, and also in Manchuria. The Chinese grew it long before Indian opium came into China. The Chinese produced about one-half of what they consumed, and we sent them the other half. With respect to railways, the day for railways in China had not yet come. There were many things we had to do in China before we

introduced railways. The Chinese would not have railways for many years. Not only for the reason that Mr. Brown had suggested, but also on this account,—that at all the railroad stations there must be European mechanics, European engineers, and European officials; and in this way Europeans would pervade the whole country. This is what the Chinese feared; and it was this fear which would keep railroads out of the country for a long time to come.

Third Meeting, December 14th, 1868.

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT, in the Chair.

PRESENTATIONS.—*The Marquis of Ely*; Dr. A. E. Mackay; R. H. Glyn, Esq.; Lieutenant T. H. Holdich; Sir Charles Savile.

ELECTIONS.—W. S. Dunbar Abbott, Esq.; A. S. Bickmore, Esq.; J. A. Braid, Esq.; Colonel David Brown; William Mead Corner, Esq.; Henry Cook, Esq., M.D.; *The Marquis of Ely*; Rev. Edward Hale; J. A. W. Harper; Alfred Hooper, Esq.; Thomas Johnston, Esq.; Captain H. P. de Kantzow; William Nicol, Esq.; William T. Palliologus, Esq.; John Ronalds, Esq.; Joseph Seaton, Esq., M.D.; William Strang Steel, Esq.; J. T. Stubbs, Esq., M.D.

ACCESSIONS TO THE LIBRARY FROM 23RD NOVEMBER TO 14TH DECEMBER, 1868. *Donations*.—‘*Travels in the East Indian Archipelago.*’ By A. S. Bickmore, 1866. Donor, the author. ‘*Commercial Reports: China and Japan, 1866.*’ Donor, the Hon. E. Hammond. ‘*Peruvian Coast Pilot.*’ By Captain Aurelio Garcia y Garcia. New York, 1866. Donor, the author. ‘*Mount Vesuvius, 1866.*’ By J. Logan Lobley. Donor, the author. ‘*To Ophir Direct (South African Gold-fields).*’ By Bamangwato. Donor, A. Broderick, Esq. A collection of original Maps and Documents relating to Routes in the Vicinity of the Niger, made by Clapperton. Donor, W. D. Cooley, Esq. ‘*Alaska (formerly Russian America), 1868.*’ By Frederick Whympers. Donor, the author. Transactions of Home and Foreign Societies, &c.

ACCESSIONS TO THE MAP-ROOM SINCE THE LAST MEETING, NOVEMBER 23RD, 1868.—Map of Australia, showing the proposed Route of Exploration from East to West, through the Centre of Australia, as suggested by Dr. Neumayer. Presented by Dr. A. Petermann. Map of the North-West Part of Africa; showing the Explorations of Gerhard Rohlfs, from Tripoli to Lake Chad. On 2 sheets. Presented by Dr. A. Petermann. Map of Brazil. By Colonel C. J. de Niemeyer. Presented by the author. 3 Atlases of Brazil, viz.:—

1. Atlas of the River San Francisco, with Appendix; 2. Ditto of the River Amazons; 3. Ditto of Brazil, in Provinces. By Dr. Candido Mendes D'Almeida. Presented by the Brazilian Minister. Also two copies of the City of Buenos Ayres. By S. Salas, &c., &c. A Photograph of a Model of Victoria, Australia. Presented by C. D. Liger, Surveyor-General.

The following paper was read by the Author:—

From Metemma to Damot, along the Western Shores of the Tana Sea.
By HENRY BLANC, M.D., M.R.C.S.E., F.R.G.S., &c., Staff-Assistant-Surgeon R.M. Bombay Medical Staff. Lately on Special Duty in Abyssinia.

[EXTRACTS.]

THE distance from Metemma to Aschfa, the district where we met Theodore, is about 240 English miles; and to accomplish that journey we had to march through passes and defiles, follow the western shores of the Tana Sea, cross some of the finest provinces of Abyssinia, and ride over undulating plains, graced by the presence of mighty herds of cattle, or walk single file amidst boundless cultivated fields.

The line of march necessity enforced upon our troops was the lofty, irregular, mountain-chain separating the sandy shores of the Red Sea from the plateaus, plains, and valleys, of Abyssinia Proper. A barren, desolate tract, the watershed of the Mareb, the Tacazzé, the Jeddah, and the Bechelo, as different from the lands they beautify and enrich as the snow-capped peaks of the Swiss Alps, the cradle of many a mighty stream, are a dreary contrast to the rich and fertile regions watered by the Isel or the Rhone.

After leaving Metemma, the first 30 miles retain still many of the features of the plain, mingled here and there with the first vestiges of the mountain-ranges, rising so bold and grand on the distant horizon; stunted acacias, our constant companions in the Soudan, cover here again every rising ground, forming small detached woods, graced by tall venerable tamarinds, or entangled with some thorny varieties of the *leguminosæ*. The ravines and small valleys, luxuriant with tropical vegetation, are but miniatures of the glorious valley of the Atbara. All these have their rivulets, and, like the mighty tributary of the Nile, are lined with trees, similar to the boulevards of a great city, and surrounded by wooded gardens so lovely in their savage beauty.

When we passed, the tall grass was just losing its green tinge for a paler hue; trampled and beaten down on the almost hidden path, it covered, like a carpet, the stony ground—a welcome friend to our

barefooted followers. Every tiny valley, every cool ravine, rejoices in its brook of limpid water, a crystal line playing in flowery beds, the home of a countless host of the feathered tribe. But day by day the scene changes, and, as we approach Wochnee, several hills sentries of the distant blue mountains, lay in our route. The rounded hillocks give way to conical mountains or to small plateaus—diminutive models of the highland plains; still the gum-trees, now and then the sycamore, further on the fir. But, as we advance, the whole country assumes a more barren aspect; the valleys are longer and wider, the stream deeper, more rapid, bounding, wearing away the earthy banks, and carrying to Egypt Abyssinia's valuable tribute. Each hill we cross has more and more the appearance of the temperate zone, and even the valleys, deep as they are—now several thousand feet above the Soudan Plain—have lost much of the beautiful vegetation we so much admired, are stern, cold, and formal, nearly desolate; and, were it not for the bamboo forests, so stately, so erect, so lofty—giants laughing at us poor pigmies as we dodged through their thick close lines,—they would be as barren as the very hills themselves. Volcanic rocks have now everywhere taken the place of alluvium, sandstone, or granite; columnar basalt shapes into ambas and forts the crest of many a mountain; our zigzag road is paved with dolomite, and pumice and conglomerate roll under our feet as we wade through the mountain-torrents.

After leaving Sounkwaha we cross the last small mountain-range that stood in our way, and from that elevation survey the whole space between us and the Abyssinian plateau. The mountain-chain appears broken up, and the whole space dotted with closely-packed isolated lofty peaks, separated by longitudinal valleys, all leading from one to another, and in the direction of the high land in front. At last we reach the foot of a towering perpendicular wall, some 2000 feet above our heads; the officers of our escort lead the way, and we follow, climbing the side of the precipice by a narrow, slippery footpath, at times so steep, so abrupt, enough even to make the Alpine chamois giddy, that we shut our eyes, and dare not even cast a passing glance at the terrible yawning abyss below. Once fairly on the Abyssinian plateau, the traveller is amply rewarded for his pains; but what struck us even more than the wonderful panorama displayed before our eyes, was the sudden and complete change in everything around us, and it seemed difficult to conceive that only a few thousand feet separate such opposite and different climes.

To us, for so long denizens of the plains, the mountain breeze appeared delightfully fresh and cool, and our old enemy the sun

we contemptuously allowed to play over our uncovered heads. The grass, short and fine,—nay, daisies and blue-bells,—could this be Africa, or were we the playthings of fancy, the victims of delusion, and awake dreaming of home and country strolls? A roll on the flower-speckled grass, a long pull of the fresh breeze, that best of stimulants, and feeling strong and refreshed, we stroll about in search of the unknown: there is a charming bower, a blending of the sweet smelling jessamine and of the wild white rose: there, behind yonder village a dense grove, full of cactuses, dark with cedars, enclosed by roses, jessamines, and sweet briar.

A few miles from Walli Dabba, on our road to Kanoa, the chief of our escort bids us himself abide awhile and admire the gorgeous noble vista. Behind us a long blue line of mountains, running west to east; and towards their north-eastern extremity, under almost yonder hidden peak, a dimly defined clump of trees marks the spot where Gondar then stood. From those mountains a green shelving plain dotted with villages and many ruins, watered by hundreds of rivulets, all flowing towards the south, stretches to the very margin of the lake, a fertile region—Dembia, the granary of Gondar. To the left more mountains, running north to south, seem to rise from the lake itself, towering higher and higher as they disappear towards the east; and on a level with the loftiest peak begins Abyssinia's noblest province—Begemder, the land of sheep and corn. In front the lake stretches far and wide, and beyond, towards the south, a dim outline, the bold towering Godjam range. To our right, extensive shelving undulating plains, with now and then a dark peak on the distant horizon, some lonely Amba, in Theodore's native land, Koura, or part of the range that bounds Atchefur towards the west.

Our route now leads us through a fine open country, up and down a succession of rounded hillocks, shelving towards the Tana Sea. No timber, hardly even a solitary tree; now and then a few thorny bushes, our favourites the wild rose and the jessamine, or a few kolquals in sheltered ravines; altogether a wild-looking savannah, replete with game, the home of herds of antelopes, staring vaguely as we pass along, and as yet untaught to see in every man an enemy, unmindful of our presence, resuming their interrupted meal.

To Goja the descent is gradual but constant, and that village, quite on a level with the lake itself, cannot be less than a thousand feet lower than the plateau of Walli Dabba. From that spot (Goja), the lake is not unlike a huge picture; green shelving shores and blue distant highlands are the frames worthy of such a gem.

From Goja to Belass we cross the same undulating plains; but

near the lake itself the ground is frequently marshy, and the many small creeks appear from a distance like green waving fields, so dense are the bulrushes.

Here we meet, for the first time since the nearing the lake, with the fig-bearing sycamore; and at Amous Gebie (the market of Thursday) with some fine specimens of the Chuba, a kind of laurel under whose wide-spreading branches, the villagers from many a mile around held in former days a weekly well supplied market.

From Belass the ground insensibly but gradually shelves upwards towards the south and west. Villages now and then begin to appear, scattered, dispersed, and far apart, mingled with ruins, the same black ruin, the work of fire lighted by a pitiless hand, casting a gloom on the few standing hamlets a passing fancy allowed to remain. For the first time since leaving Walli Dabba, we see a few hungry-looking peasants, ploughing long stony fields, and urging their emaciated-looking bullocks, with shouts and cruel blows from the long hippopotamus whip, into a slow monotonous step.

From Kancoa to Aschfa (frontier of Damot) it is impossible to conceive a more lovely country, to dream of a more beautiful fertile region, slightly hilly, the prospect is even more pleasing than the green plains watered by the Tana Sea.

The province of Wandige, with its long, rolling, undulating ground is something, I fancy, very much like the American prairie, studded here and there with isolated conical peaks, of an average height of 800 to 1000 feet. Mountain-ranges appear to the west and south, the watershed of the Blue Nile, and by a gradual ascent our route takes us across some small mountains, the foremost range of the Gojam chain. Villages crown almost every mound, unless the tall cedars, the sycamore, the guicho, and wild coffee-tree, point out the secluded spot above which arises, half-hidden by the dense foliage the modest Coptic cross.

Thousands of cattle graze over almost boundless natural meadows, watered by countless streams, and only checked in their vastness by endless cultivated fields, wherein in the same vista can be seen the peasant ploughing, the green sprouting corn, and the ripened harvest ready for the sickle.

We cross the Kiltie, and enter the land of the Agawa.

One tribe, it is said, originally with the Agaws of Lasta,—did they at one time possess themselves of Central Abyssinia, and limit their conquest by the Lasta Mountains and the Godjam chain? Were they, as some assert, the Aschtoctons, inhabitants of the land driven and scattered east and west by the Amharas? No record of the past, no deed of the present day, can bear out that theory. Not

they the brave, hardy mountaineers of Lasta, the bold horsemen of Agaw Medar: never has Amhara lance driven out of their fathers' land the gallant Agaws; they are conquerors, not a conquered race! Like other Galla hordes, they came some day from Central Africa: one section of the tribe settled on the lovely plateaus watered by countless streams, a land of milk and honey; others, of a more adventurous spirit, pushed further on, and took possession of a mountainous district, better fitted for a war-loving clan. I like the Agaws; I like their fair handsome faces, their long silky hair, their well-knit forms, their daring, their courage; and, above all, feel grateful for their kind genial welcome, such as only a brave race can give.

Agaw Medar, more favoured by nature, more prosperous even than Wandigé and Atohefur, a land of horse as well as cattle, was also more fortunate and never fell under Theodore's displeasure. He was too cunning to attempt to plunder a land protected by such a valiant race. Here we saw the Galla cows, with their immense long horns, some four feet long, gracefully worn by small, short, well-knitted cattle; here also we met with the wild peaches, sweet limes, and the beautiful kosso-tree, a noble, gracefully stately bunch of flowers, pink-rose or yellowish white, dropping like golden grapes, — a priceless remedy under a lovely form.

Onward we march, and the same fertility prevails everywhere; but the aspect of the country somewhat changes, — more hilly, more wooded. We pass by Zugda, Zarkatcha, Gardomite, Kanka, small towns rather than villages; churches and market-places, those signs of trade and piety, are nowhere more numerous. Nevertheless the Agaws are considered a rude and unchristian race; churches may arise around their villages, but still at heart they are Pagans, says the Amhara. For me, who only saw them good, kind, and hospitable, whatever heresy may be grafted on their faith, I believe that they are truer followers of Him who loved such as them, than the vain-glorious, bigoted, self-worshipping Abyssinian.

We pass Quorquora and the River Terinka, flowing towards the Blue Nile; more villages, more cultivated fields, more flowery prairies, rich in horse and cattle; we cross the Quaschim and the Gamasson, again to wind through rivers. Skirting hills on our left, we pass at the foot of the small picturesque amba of Ziri, and leaving the hilly plain now wind our way through wooded valleys, and ascend the white sandstone mount of Injenbeer.

On the banks of the Messinie, with regret we bid good-bye to our Agaw friends, and pass into Damot.

Another day's march, and we reach our journey's end; we approach

the Imperial camp, so well hidden in valleys and woods from the gaze of all that, were it not for the smoke arising from miles around yonder hill, graced by the white, red, and black tents of Theodore, we might have believed that the bold spirit of that strange man dwelt alone in that plundered, desolate region.

After a day's halt in the Emperor's camp, Theodore sends us word that on the morrow we will march with him; the army cries for bread, he says, and the bad peasants refuse to bring in any more supplies. Why not have spoken the truth? and said, "The enemy protects their fields; to feed my army I must plunder the few districts still faithful to me."

At the eastern extremity of a valley, on an average about a mile in width, separating Damot from Metcha, we crossed the Blue Nile. At that spot that river flows between well-wooded banks, some 10 feet high and about 30 feet in width; the stream is on an average from 2 to 3 feet in depth, the current moderate, and the bed stony.

We parted from Theodore at Flagitta, on the border of Agaw Medar, and passed again through the same fertile region we had crossed a few days before, this time, some miles to the eastward. Here, again, we meet with a succession of small running streams, all flowing eastward towards the Nile; after a few days we once more followed our former route, and from Zugda back to the lake halted generally on the very same ground we had selected on a previous occasion.

We were bound for Kourata, the principal commercial city on the eastern shore of the Tana Sea, almost opposite Kanao. Theodore had intimated the desire (his slightest wishes were ever for us formal orders), that we should abide at Kourata until Consul Cameron and his party should have joined us; he advised us to cross the lake in native canoes, sending our horses and mules by land to Kourata.

We did not tarry this time at Kanao, but pushed on at once for the lake some 4 miles due east from that place, and encamped near a small Waito village on the very beach itself.

A few days were required to bring from Kourata, Dek, and other ports, the several hundred bulrush-canoes we required; and, as the whole Imperial fleet at the time in existence was not deemed sufficient to convey our large party, the Waitos were ordered at once to collect bulrushes and build a few dozen of these pretty, but rather frail skiffs.

The poor Waitos, at first sight, are not very prepossessing; and to their uncouth appearance, as well as to their indulgence in the reputed unclean flesh of the hippopotamus, are they indebted for

the kind of odium in which they are held. Supposed to be in league with boudas, ginnas, and other evil spirits,—a slur not to be despised in a land where to be feared is better than to be respected,—they are generally left alone.

The Waitos rejoiced at the sight of our rifles, and were the first to propose to lead us against the huge quadruped, their foe and favourite food.

Accustomed to attack the hippopotamus with their short spears, a chase full of dangers and perils; expert fishermen, the only sailors of that inland sea; bred to hardships and fierce struggles; they are brave and speak lightly of the fearful wounds but too often their share in the life and death strife between them and the infuriated monster. Many succumb in the exciting contest, whilst some more fortunate live to boast of their hard-won scars.

We did not join the Abyssinians in their odium against these poor people: on the contrary, finding them civil and obliging, we treated them with kindness, gave them, unasked, many a trifle, and saw with pleasure that they deeply felt our considerate manner, and knew how when treated as fellow-men to behave as such.

On the 13th of February we were paddled over to the island of Dek, and to stimulate our splashers (I cannot call them rowers) we offered a prize for the three first arrivals. At starting, the novelty of the idea, and the hope of enriching themselves, produced a considerable excitement among the Waitos; but after a while, when it appeared from the lead some of the canoes had gained that the race was over, the natural apathy of all Africans overcoming their excited passions made them turn a deaf ear to all appeals, and nothing we could say could induce them to try to redeem the day's fortune,—the foremost, as well as last, resuming their ordinary snail's pace.

Dek is a cluster of several islands. The two largest separated by a narrow and deep channel, appear, except on near approach, to form only one, about 7 miles in length to a couple in breadth. Around them are grouped several of a smaller size; one of them, visible from a great distance, is merely a mountain-peak arising abruptly from the water.

The larger islands are inhabited; contain several large villages and four churches, all of great sanctity. Large and small are all well wooded; and no prettier spot, no more fairy-like island, could be imagined than those of Dek. They give to the scenery a charm, even the Leman with all its beauties cannot rival; nothing can be more graceful on near approach than their dark basaltic walls a few feet above the water, covered with a splendid luxuriant vegetation

gracefully bending over the sides, and reflecting their charming shadows in the deep blue waters of the lake.

The following morning we started for Kourata. Kourata is a very ancient city: King Claudius's queen built and endowed a church on that small headland, and, as Abyssinnia was at all times a land of strife and warfare, merchants eagerly sought the protection of such a sacred asylum, and soon an important commercial city arose at the foot of the church of Kudos-Georgis.*

Many of the houses are built of stone and mud, and those of the principal merchants boast of wooden doors, square rooms, and ornamental ceilings. Some of the best houses were placed at our disposal; but we were too fond of cleanliness, fresh air, and abundance of water, not to avail ourselves of the proximity of the lake.

Except towards its north-east extremity, we have been able to arrive at a very accurate knowledge of the Tana Sea.

We saw it in its general outline first from the heights of Walli Dabba; secondly, from the promontory of Zagé; we followed it along the western shores from Tankal to Kanoa, and crossed it in native canoes from Wandigé to Dek and Kourata, and several times between that city and Zagé. Theodore had for once told us the truth when, on leaving him in Agaw Medar, he said "I send you to Kourata, as I know from Plowden that Englishmen like our lake." He was right: we enjoyed the lake immensely; we loved its clear fresh water, its calm stillness; the blue mountains and dark island reflected in its unruffled surface; we were never tired of gazing on the plying canoes, on the grotesque frolics of the snorting hippopotami, at the long files of laughing maidens, winding their way along the beach, bending under the weight of large water-jars; . . . the very bulrushes themselves had their charms. Without the lake, the few—very few—happy days we spent in Abyssinia would not live in our memory a pleasing contrast to our many misfortunes.

Such is, in its general outline, the Tana Sea, and the several provinces of Western Abyssinia we passed through. The climate on the whole is good; in the valley of the lake itself some parts are feverish and unhealthy; the heat also in the middle of the day is not sufficiently tempered by the cool mountain breezes, but some miles from the lake, or a few hundred feet above its level, even the plateau of Tschelga, the high plains of Atchefur and Agaw, with all their many advantages, cannot in that respect claim any superiority—all are alike cool, pleasant, and healthy. Western Abyssinia is within the range of the tropical rains; there much earlier, longer,

* St. George.

and more important than in Eastern and Northern Abyssinia. The whole—be it valleys, plains, or plateaus—is watered by countless streams; the soil, the detritus of volcanic rocks, is so rich, of such fertility, and enjoying as it does so many climatic advantages, we cannot be surprised if three harvests are usually reaped in a year. Tef, the staple food of the country, grows almost everywhere, except on the higher plateaus, where corn and barley thrive so well. Cotton covers the plains of Foggara; wine is made from the grapes of Madre Marian; honey, fragrant from the sweet perfume of wild flowers, is ludicrously abundant; and the herds of cattle, in peaceful times, of such magnitude, in numbers hardly to be credited, enough to supply a thousand cities. Western Abyssinia, well may we exclaim, is, indeed, a land of milk and honey, a “land blessed by God but cursed by man.”

The paper will be published entire in the ‘Journal,’ vol. xxxix.

The President said this communication of Dr. Blanc’s described that side of Abyssinia which had not been explored by any European in a scientific manner, and was not known even to Bruce: we were, therefore, infinitely indebted to Dr. Blanc for bringing before us this prelude, as it were, to the narrative of the two years’ sufferings which he had afterwards, unhappily, to undergo. He would ask Dr. Blanc to give, *visu vocis*, some account of his capture and imprisonment with Mr. Rassam, the head of the expedition, and to give the meeting his view of the personal character of Theodore, a tyrant who, while carole of the most horrible cruelties towards the weak and unoffending, quailed before the brave Agawa who resisted his power.

Dr. BLANC said they left Aden in 1864, to convey a letter to the Emperor Theodore. Consul Cameron was in chains; and he wrote to Egypt, saying that there was no release possible for him unless a certain answer was given to a letter that he had forwarded from King Theodore. The party, consisting of Mr. Rassam, Lieut. Pridoux and himself, waited about thirteen months at Massowah before Theodore assented to their going forward. They were treated very well on their first arrival, and were promised that everything should be done according to the Queen’s request, and that all the captives should be set free and made over to them. The former captives reached Kourata on the 12th March, and Mr. Rassam informed the King of their arrival. Theodore sent, saying he wanted to know whether they thought that he was in fault, or that the captives were in fault. They had heard on several occasions that when Theodore spoke of Consul Cameron and Mr. Stern he lost his temper, and they thought it advisable to say that the captives were wrong. Theodore was, for a time, well pleased with the answer; but the moment it was acknowledged they were wrong, according to the Abyssinian view of the case, the King demanded a substitute or compensation for the injuries they had done him, and that compensation was to be in the shape of workmen. Mr. Rassam very cleverly got over that difficulty; but Theodore, when he saw that kindness and friendship would not gain his ends, determined on violent measures. On the 13th of April he sent for Mr. Rassam, Lieut. Pridoux and himself, stating that they were to go home. He did not want to see the captives, as they were bad people; but Mr. Rassam and his companions were his beloved friends, and he could not allow them to depart for England without bidding them good-bye. They were all to meet at Taulal at the extremity of the lake. The baggage was to go by boat, the mules and horses by land. When they reached Zagé he received them with his usual courtesy; but, instead of being taken to a tent, they were first conducted to a

large audience-hall, which was lined by all the great officers of the state in their gala dress. They had no sooner entered the hall than the chief minister bowed to the ground. The King was not present. The throne was at the extremity of the room, and was empty. Nine men, who had been posted there on purpose, rushed upon them, took away their caps, uniforms, and swords, and dragged them to the other extremity of the hall, where they were told to sit down and wait the King's commands. He sent some very foolish questions,—asked why they had not brought the former prisoners, why they had written to the coast, and many questions which were of no more importance. After a time he dismissed them, and kept them three days in a small tent. On the morning of the fourth day he said, "Now your people have come back from Koumata, we will meet to-morrow and be reconciled." On the 16th of April they were brought before the King in the presence of his troops, and they were told to sit down. They had not been seated many minutes when they saw Cameron and their countrymen brought in chained two and two. He had them placed before him. He asked kindly how they were. They all bowed and kissed the ground, and after that he opened the chains of Cameron and Bariel. Then he asked them questions, and completed the proceedings by reading his pedigree, according to his usual custom. After that, they were left at Zagé in one enclosure. They had tents, but they were a kind of semi-prisoners, and could not go out without a guard of honour. Flad was sent to England, and they had to wait for his answer. Not long afterwards they accompanied the King to Gaffat, where he gave them some of the best houses in the place. The next morning he came and said it was not a suitable place for them to live in; so he had a large workshop transformed into a residence for them. He had it lined with native cloth, and he himself swept the room. The third day he came again, and said that would not do either; so he took them to another house. Each time he brought his throne with him and left it in the room, with the intention that one of them might sit upon it,—it being the law of the country that anybody sitting on the throne was worthy of death. Luckily they knew all about it, and they asked him to take it away, which he consented to do. The next day—the 25th of June—he sent for them, and said they must go up to his camp to be witnesses of a political trial. Instead of being received by one of his officers, they were ushered into a black tent, and told to sit down on the ground without any carpets. They were told they must stay near the King; he could not allow them to be out of his sight. He taxed them with conspiring with the Turks and the French against him, and said if it were not true he would release them, and their guns and property should be restored to them. Dr. Blanc said he was sent by the King to Gaffat to look after some of his people who were sick. He stayed there some days, and the others, except one, remained in the black tent at Debra Tabor. For several days all went on well, when one day he came to the foundry to see some guns that were being made, and he sent word for Dr. Blanc to come over and see him. As he was going he was joined by two European workmen, and they met the King in the road. They pulled off their caps and bowed to him. The workmen put on their caps again, while he put his in his pocket. It was lucky that he did so, for no sooner had they reached the foundry than the King began to ask him how he was. As they left the foundry a beggar came up and asked for alms, saying that the English lords had relieved him, and he now asked the King to assist him. The King said, "Whom do you call 'Lord' in this country except myself?" and turned round and ordered his executioners to beat him to death, and in about two minutes the poor beggar was killed. But this murder did not seem to cool him: on the contrary, the sight of blood acted upon him as it does on wild animals, and irritated him still more. He turned round with his lance in rest, and, seeing Mr. Rosenthal, said, "Seize him," and asked him several questions; and then, pointing to Dr. Blanc, said, "Seize that man whom they call a doctor." Immediately

twenty people rushed upon him and seized him. For a few minutes Theodore talked to Mr. Rosenthal, and then turned to the workmen and upbraided them for having covered themselves after he had passed. This seemed rather to cool him, but, turning round to the soldiers, he said, "Why do you hold him? Who told you to hold him? Who told you to seize him?" They immediately let Dr. Blanc go, as if he had been an electric machine. He called him forward and said, "Doctor, you are my friend, we have always been good friends together; but some people speak bad of me, and I want to try them, so you must come up to Debra Tabor and be a witness of the trial. Upon reaching Debra Tabor the King sent for Rassam and Stern, and said, "I want to try you." When they were all in line he addressed himself to Mr. Stern, and then turned towards the others and asked some stupid questions, as he generally did. At the end of the affair they were taken to an empty powder-magazine, which was very small, without either window or door, only a small opening to creep in at. When they were inside they could not see each other. At last some guards came with lights and brought in some skins for them to lie upon. Just as they were thinking they were quiet for the night, the King sent a message to say he was coming; and as he was generally in an irritable mood at night from drinking, they were alarmed at hearing it, and sent and tried to persuade him not to come. However, he did come, bringing a large jar of mead in his hand, and accompanied by a man bringing a bottle of brandy. He tasted some of it to show that it was not poisoned, and then said, "We will chat now. Tell me all about the Pope of Rome." They remained in the dark hole for about three days, when they were sent on a march with his majesty for five days. On the 12th July they reached Magdala, and were shown into their prison. It was an empty house, formerly occupied by one of his chiefs, a small place, about the size of the table before them, and the whole eight of them were sent in there. Three days they were left alone. They had guards outside, and the captives had to sleep some outside for want of room. On the 10th July the chiefs came and said they had a little business with them. The little business consisted in putting on chains. These chains were rather heavy, weighing about ten pounds, and consisting of three links and two large rings. They were pushed on the ground, and these were placed on their feet; the operation being done by a blacksmith with a large sledge-hammer, until the two extremities were bent in, and then riveted down. The operation was rather painful, because the blow did not always fall straight upon the iron but on the side, and struck against the bone. They were kept in chains for twenty-one months, shut up in that place with nothing to eat but what they could buy. The King said they were gentlemen and were rich, and it would be unbecoming for him to feed them. Fortunately they always managed to live. Sometimes they could only procure very poor rations, sometimes they were able to buy and kill a cow. During those twenty-one months the King was plundering his country, but his troops abandoned him more and more, until they had dwindled from forty thousand or fifty thousand men down to not more than ten thousand by the time the English troops arrived off Magdala. These men were employed in dragging his guns up to Magdala, and carrying his property up to the fort. When he arrived there on the 29th, the servants rushed into the place looking very sad, and said, "The King is come on the mountain, and he never comes without killing somebody;" and they added that he was a little drunk, which made it worse still. In about half an hour's time he sent for Mr. Rassam, and when Mr. Rassam approached him the King seems to have got into a good temper all at once, for he received him very well, and said, "Oh, where are those two gentlemen that came with you? I do not know them. They are neither my friends nor my enemies, but if you will stand security for them I will open their chains." Mr. Rassam said he would be security for them, upon which the King sent for Mr. Flad and Samuel to open their chains. To open the chains they put

in a wedge of iron so as to separate them a little, and then very strong ropes were passed in and formed into loops. In these loops large stakes were placed, and five men pulled on each rope; so that something must give way, either the chain, or the ropes, or the leg. It depended upon whether the prisoner was in favour, for sometimes it was the leg that was broken. Fortunately for them they were in good favour, and they received no serious injury. After the chains were taken off, the King sent for them and said, "How are you? How have you spent your time?" He said he had imprisoned them, though they had done nothing, because the Government was bad, and he wanted to show them that he was a strong king; and now that the English were coming, he wanted to show that he was not afraid, and therefore he had opened their chains. At last he dismissed them and went down to his camp. On the 7th April he sent for all the prisoners, natives and Europeans, and they were all taken down. He was all day on the height Selassie, looking at the troops coming forward. When he saw them he was rather good-tempered, and would come down and open the chains of some of the prisoners. When he did not see them he was rather sulky, and would kill some prisoners. It was on that day that he killed some three hundred by throwing them over the precipice. On the next morning he sent the Europeans back to the mountain, and said, "How dare the woman send troops to fight me!" He was rather angry in consequence of a message which he had received from Lord Napier that morning. He was anxious for a letter, but the moment the message came he would have nothing to do with it. On the next morning, Good Friday, the great battle was fought to which the captives were indebted for their deliverance, and, after the battle of Fala, he completely lost his mind, changed his tactics, sent for the prisoners, and said he had lost everything, and asked them to go and make peace between him and the English. Mr. Rassam said he would interpose, and suggested that Mr. Flad and Lieut. Prideaux should go for him. In the mean time the King had taken a little liquor, and he got very black again, and would not listen to the envoys when they came back. The next morning he sent for them, and asked what their advice was. A chief said the best thing was to listen to Mr. Rassam, and make peace with the English. The consequence was that Mr. Rassam, Mr. Flad, and Lieut. Prideaux were sent with a letter to Lord Napier; and an answer came into the camp, stating that if the King would submit to the English, and surrender himself and family, he should be honourably treated. He asked what was meant by honourable treatment. Did it mean that they should conquer his country, or treat him as a king? When Mr. Prideaux told him what was meant, he got into a fearful rage and wrote an impertinent letter, and called all his chiefs about him. At last he resolved to commit suicide, and he (Dr. Blanc) came to the conclusion that he also intended to kill the prisoners. At all events, on the 11th, the day after Fala, he sent for them in the afternoon with a message, "Go to your people; you are sent for. Your property you shall have another time." They thought it was rather a queer message, and the chiefs who brought it, who were friendly towards them, appeared very downcast and silent, and the head jailor was almost crying. They asked what was the matter, and had strong suspicions that the King wanted to kill them. They went down, and some of the chiefs sent them a message to say that he was in such a rage that if he met them he would kill them. However, they sent a message to the King to say they would not leave without wishing him good-bye. The man came back with a message that he would only see Mr. Rassam; the others he would not see, and they were to go away by a road which he mentioned. Rassam went to the King and the others marched along the road. They were told to stop a few minutes as the King was speaking to Mr. Rassam; then they were told to march on again. They thought it was all right, when all at once they came to a turn of the road which was on the side of the precipice, and just as they turned the corner they found themselves face to face with Theodore, who

was standing with twenty of his men in a line behind him, each with a musket over his shoulder. The King did not see them at first, as he was half-turned round speaking to the first man near him, and taking his musket from him. The Europeans stopped and waited till the King should turn round. When he did turn round he looked at them for a couple of seconds, and, then looking Dr. Blanc in the face, the expression of rage which they observed when they first saw him gave way to one of sadness, and he said in a low voice, "Good-bye, go away." They bowed low, and went away. After that they met Mr. Rassam and went on, thinking now they were perfectly safe; but, when they were getting outside the camp, one of the guards on the top of the mountain called out, "Stop, stop!" and messengers brought them their swords, which the King had taken away two years before, with the message, "I have taken care of your swords; now I send them back to you again. Good-bye." They marched on, and a few miles onwards they reached the English camp, and rejoiced to find themselves amongst their countrymen free from the captivity which they had so long endured.

The PRESIDENT then called upon General Sir Charles Staveley to say a few words, remarking that Geographers would never forget the obligations they owed to the gallant army under Lord Napier, which accomplished such great results; and not the least grateful was the talented gentleman who had just addressed them, for surely no diplomatist was ever sent on such a mission to such a sovereign as King Theodore.

SIR CHARLES STAVELEY said, as he had been called upon, he might, perhaps, remark upon the great contrast between the country which had just been described by Dr. Blanc and that which the army had to traverse. The province of Agaw was described as flowing with milk and honey. In the country the army passed through there was nothing at all except a little barley for the horses, and flour brought in by the natives; and he might add, except milk and honey. Lord Napier used to describe the country as a land of milk and honey, but scarcely anything else. With regard to the geographical features of the country, the army had to cross a succession of mountains and ravines, which increased in height and in depth as they went along the ridge or watershed. It was this which gave rise to the story told of a soldier in the 'Times,' who said: "They may call it a table-land, but I call it a table turned upside-down, and we are marching up and down the legs."

The PRESIDENT said we had already had excellent accounts of the great eastern ridge from the Secretary, Mr. Markham. At a future day the geology of that eastern ridge would be well described by Mr. Blandford; and Dr. Henry Cook had prepared a paper on the meteorology of the region. The communication to-night gave an account of a fertile region of Abyssinia with which we had hitherto been entirely unacquainted, and it completed our knowledge as far as English travellers had penetrated. The southern part of the country, on the eastern side of the Lake Tana, had been described by Dr. Beke, who described the Galla country a great many years ago, for which he received the Gold Medal of this Society. He congratulated Dr. Blanc upon having escaped, and upon having recovered his health; and he rejoiced that Her Majesty's Government had granted pecuniary recompenses to Mr. Rassam, Dr. Blanc, and Lieut. Pridenax.

Mr. CLEMENTS MARKHAM would only add that there was still an immense region to the south entirely unexplored, as fine a region as and probably a finer region than any in Abyssinia, extending from the point which Dr. Beke reached to the Equator, also a great mountainous table-land, which, as far as he knew, was entirely unknown. It had been reached as far as Kaffa by an aged Italian priest, but the other parts of this great region had not been visited by any European.

ADDITIONAL NOTICES.

(Printed by order of Council.)

1.—*Exploration in the Neighbourhood of the Norman River Settlement, in the Gulf of Carpentaria.* BY W. LANDSBOROUGH.

(Communicated by J. S. LAURIE, Esq.)

February 17th, 1868.—I left Sweer's Island in the *Pioneer* steamer at five o'clock on the evening of the 17th February, 1868, for the Norman River settlement. We had a fine night; the steamer was very comfortable; and on the following morning, having steamed 70 miles, I saw in the distance the mouths of the Norman River, named by Dr. Leichhardt the Yapper. The water from recent floods was nearly fresh for at least three miles from the land. At seven in the evening we anchored for the night at a place 30 miles up the river, and 20 miles from the settlement.

19th.—This morning, the 19th, the schooner *Lily* passed down the river on her way to Sweer's Island, with the wind and tide in her favour. Her master, Captain Winthrop Ellis, reported that the people were all well at the Norman settlement.

Since yesterday afternoon, the tide continued strong against us. Weighed anchor at 9 A.M., and arrived early in the afternoon at the settlement. This new settlement is on a fine high gravelly ridge. The finest hotel in the district of Burke has been built on its summit. There are several other buildings, and there are about forty residents, which is nearly as many as there are at Camarvon (Sweer's Island), or at the oldest settlement, Burke-town. The people seemed tolerably healthy, and were most sanguine of the settlement becoming the most thriving place on the main land of the district.

20th.—Mr. Phillips, the government surveyor, and I rode out to see the site which Mr. Sharkey, the Crown Lands Commissioner, had chosen for his office, and we afterwards tried to go along the road to the Chinaman's Garden, at a place called the Four-Mile Swamp, but the country was so soft from the recent wet weather, that we had to return without accomplishing our task. There was no wind, and the mosquitoes were so troublesome all day, that one's two hands were required to keep them off. At night it was impossible to sleep without the finest curtains.

23rd.—At five in the morning of the 23rd, I accompanied Mr. Phillips to explore the Wills, a creek which joins the Norman River 25 miles below the township; hitherto it was considered to be Dr. Leichhardt's Carron. This notion was found to be incorrect, and it was named the Wills. The steamer, which was returning down the river to Sweer's Island, gave our boat a tow. We reached the Wills in 4 hours, after waiting the greater part of the day at the junction. The tide turned, and we traced the Wills 14 miles. Its width for some distance is about 40 yards, and the water of a considerable depth. The banks are low, and flooded during high tides. We had some difficulty in finding a dry spot for our encampment. The mosquitoes were so troublesome, that we could not eat our supper with any comfort. A more disagreeable spot could not be imagined even by the novelist who painted the American Eden.

24th.—Next day, 24th February, in the afternoon, the tide turned in our

favour, and we got up six miles. The Wills was there about 15 yards wide; its water was very shallow, and the banks so low, that we had to land several times before we found a spot sufficiently dry to encamp upon. During the night there was a thunder-storm, but fortunately for us it was not accompanied by rain.

25th.—This morning, the 25th, we started homeward bound. The mosquitoes were too troublesome to admit of our taking an early breakfast. With a strong tide in our favour, we reached the Norman River early in the afternoon, where we dined upon alligator eggs, having had the good fortune to get 43 in a newly-made heap of turf on the right bank of the Wills, about two miles from its junction with the Norman River. The eggs had a hard white shell; they were as large as those of geese, and I thought as delicate to the taste as those of hens. After waiting until near sunset, we got the tide in our favour, and our boat was pulled up to town in five hours.

27th.—This morning, the 27th, I accompanied Mr. Phillips across the Norman River from the township, which is situated on the south-west bank, and he went straight to one of his marked trees on the Wills, distant two miles. It was gratifying to ascertain that his dead-reckoning was so correct after having taken 400 different bearings.

March 10th.—I started with Mr. Phillips on the morning of the 10th March to explore the Gilbert River, and the coast to the northward as far as the Burke district extends. His men pulled our boat 25 miles down the Norman with the tide to the junction of the Wills. In the evening the schooner *Lily* passed up the river with a favourable breeze; from her we got a number of water-melons, which were grown in my garden in Sweer's Island. They were particularly acceptable to us, engaged as we were. The men pulled the greater part of the night, and early in the morning we reached Sea Reach, and landed on its right bank. The land is high, and the country good; it is thinly wooded with beautiful clumps of trees. The forenoon we spent in shooting pigeons and in eating wild fruit. The weather was showery, but fortunately for us it cleared up in the evening. This place has no name at present, but I have no doubt it is destined at some future time to be the site of a town. There is a fine view of the sea, and from the sea there is often a fresh breeze; it presents, in consequence, one of the most pleasant spots for a township that I have seen on the seaboard of the Gulf of Carpentaria. At one time it would have been chosen as a good place for a boiling-down establishment, but was rejected afterwards, as no water was to be had except by wells, of which there are several made by the Aborigines.

12th.—On the morning of the 12th March we went out to sea, but were becalmed off the Norman River estuary until noon. In the afternoon we had a light fair wind, and in the evening, after having been ashore at sunset, 2 miles north of the Gilbert, reached that river—the Gilbert—in 24 miles north of the Norman river. Last night there was a fine breeze, and we slept comfortably on the sandy beach, on the right (s.) bank of the Gilbert. It was hardly safe, I thought afterwards, to sleep so near the water, for in the morning we observed a large alligator swimming very near us.

13th.—The wind was so light this forenoon, that we did not reach the Vandiemans until the afternoon, although only six miles north of the Gilbert. We traced the Vandiemans 43 miles, and then were only half a mile south-east in a straight line, passing the heads. Mr. Phillips ascertained that the position of the entrance of the Vandiemans and its bends were exactly as laid down by Captain Stokes in 1842. After returning to the heads we pulled out to sea, and slept in the boat undisturbed by mosquitoes. The wind is very regular at this season of the year; judging from this and the last, it is easterly in the morning and north-westerly in the evening.

We started this morning, the 14th March, for the Gilbert river. We had rather too strong a breeze from the eastward, and our boat's mast was carried

away; we soon, however, got into the Gilbert by means of the cars. Unfortunately we came away with an insufficient supply of rations, and we finished the last of our meat this morning, and had afterwards to content ourselves with only half a pound of bread each a day. With the last of the tide we got up the river six miles, then stopped until sunset; afterwards we went up the river six miles further, and anchored. The mosquitoes were so troublesome that I for one could not sleep until near dawn. After breakfast on the 15th we got under weigh, with a strong tide in our favour. At two miles passed an island named by Mr. Phillips, Alpha; at half a mile higher reached another a mile long; named it India Island. Above India Island there are well grassed plains, dotted at places with ant-mounds; some of these are 8 feet in height. At 20 miles from the entrance of the river we reached a place where the water is very shallow. At this the blacks had ganyahs on the south bank, and a fishing-weir stretched across the river. The ganyahs are well adapted for keeping out the mosquitoes, but must be very close. The opening to one is not more than 1 foot in diameter. The blacks ran away. At their camp we found fishing-lines, and the branches of the cabbage-palm, which they use as sun-shades. We robbed the blacks of nothing, but I am sorry to say that all explorers cannot say the same. Before crossing to the opposite side of the river to wait for ebb tide, we left the blacks a few trifling presents. When we were nearly ready to start down the river, a great number of blacks arrived; fortunately they did not come sooner, as it is dangerous to have such wild people for any length of time at close quarters. They were probably some we had seen about four miles down the river near some fine water-holes on the south side of the river. Near these water-holes the blacks have made well-beaten paths. We had been firing our guns, which generally frighten blacks, even when not directed towards them; but these did not seem to know what firearms were, as they came fearlessly to the same side of the river as that upon which we were. We started away slowly at first, and as many as a dozen of the blacks swam after the boat, and eat eagerly of a few crumbs of bread that we gave them. I have very little doubt of the Gilbert country being well watered. The cabbage-palm branches that we observed were probably obtained a short distance up the river; and I have never seen these palms at Carpentaria, except in the bed of a river. Late in the evening we reached the heads, and pulled out a little way to anchor for the night. In doing this, we were followed out to sea by a large alligator, and when he came within a few yards of the boat Mr. Phillips shot at him. I have very little doubt, from the violent plunge that he made, that he was severely wounded.

As early as possible in the morning of the 16th we set sail for the Accident Inlet, distant 7 miles south. The wind was rather strong for our imperfectly repaired mast, and the oars had to be used again. We went ashore for breakfast on the northern side of the entrance to Accident Inlet. The entrance is wide, and the channel tolerably good. The beach is sandy, and a little above high-water mark there is a thin belt of Casuarina-trees, more commonly called oaks. This is, however, a very common feature all along the beach to the north of the Bynoe River. Under the oaks there were several blacks' ginyahs, as there were also on the north side of the Vandiemans; they were made of boughs and grass, and resemble in form the old straw beehives. They are hardly 4 feet high. I may here mention that I have never seen any ganyahs like the two-storied ones noticed by Capt. Stables and Dr. Leichhardt. I have seen, however, uncovered places on which the blacks sleep that were raised a little way off the ground, with fires all around to smoke the mosquitoes away.

A hundred yards back from the oaks there was a well grassed shallow watercourse, in which we found some water.

Accident Inlet in width is like all the other rivers of this district, inferior

to the Norman, but it is superior to the Gilbert; and again, the Gilbert is of a greater width than the Vandieman. The latter, however, is one of the worst inlets in every way of the Burke district. We got up the Accident Inlet with a flowing tide 8 miles, and landed on the northern side, where there are cliffs of a shelly formation 20 feet high, and remained there until next morning. The country is very pretty, and very like that I have described on the bank of Searach of the Norman River, but here and there more level, and subject to inundation at spring tides. During the day we employed ourselves in eating wild fruit, and in shooting cockatoos and pigeons.

Next morning, the 17th March, we had the tide again in our favour. As we ascended the river it became very narrow. At some parts down the river it was not far short of 300 yards in width, but at 20 miles from its confluence with the sea there were several islands as well as branches; the largest of the branches was only about 20 yards in width. At this place we stopped until near sunset. The country near the seaboard of Accident Inlet, like the Norman River, has high ridges on the southern side. The upper part of Accident Inlet country consists of well-grassed sparsely-wooded plains, with high ant-mounds, and watered by lagoons. The whole of the country being well adapted for stock between the Norman River and the Vandieman will, I dare say, soon be occupied. It will be easily enclosed. The Gilbert we explored in a direct line 8 miles east, and Accident 7 miles in the same direction. A fence about 16 miles in length would enclose the country between the Norman and Accident Inlet, and another 8 miles in length would enclose that between Accident Inlet and the Gilbert. Whilst waiting for ebb tide to go down the river, we were surrounded by hostile blacks, armed with spears, &c., and a fowling-piece had to be discharged at them. This kept them off, and, as far as I am aware, did not seriously injure any of them. Just at this time the tide fortunately turned, and we left and went down the river. Had they only known it, they could have easily speared us without much risk to themselves from behind the mangroves on the edges of the river, as a black fellow can throw a spear with as much force and precision 15 yards as that of a ball from a pistol. After we started, they followed the boat for about a mile, but stopped doing so on seeing one of us lifting up a gun and holding it towards them. We got to the heads at 9 in the evening. The wind being fair, we thought of going to the Norman without delay, but the surf on the bar was too much for our boat, and we anchored until morning. Next day we reached the Norman, and sailed 15 miles up it to the junction of a creek on the same side (the north) as the Wills, and of nearly the same width, about 50 yards. This creek has not yet been explored.

March 19th. The men pulled the boat up to town, a distance of 35 miles; they were very tired, which is not surprising, as their allowance, as I have said before, of rations was a very small one; and in 10 days we had gone altogether 260 miles, over 180 of which they had pulled the boat. Ducks were abundant along the banks of the rivers, but there were two reasons against our shooting many of them: insufficient time and ammunition.

I have not said anything respecting the depth of the water in the rivers, for our crew being a small one, no person was regularly employed in sounding; but this perhaps is no great loss, as the good pastoral land does not extend far inland, and these rivers will not be much required unless the back country is rich in minerals. I have no doubt, however, that were the Gilbert and Accident rivers required, vessels of 6 feet draft might be employed in them.

Before concluding, I will say a few words about Sweer's Island—Carnarvon. The township of that beautiful spot is now in a fair way of becoming the workshop of Carpentaria. Its harbour has a favourable report from all the masters of vessels that have visited it; and what Captain Stokes said after making his survey more than 20 years ago, of Sweer's Island being the only

suitable seaport for the mainland of Carpentaria, is beginning now to be realised.

The island has been settled more than two years, and its climate, for a tropical one, has proved itself to be wonderfully healthy and pleasant, even to children.

W. LANDSBOROUGH.

2.—*Note relating to the French Expedition from Cambodia to Yunnan.*

By W. H. MEDHURST, Esq., H.B.M. Consul, Hankow.

(Communicated by the INDIA OFFICE.)

I YESTERDAY had an interview with the Officer Commanding the French exploring expedition from Cochin China, the arrival of which at this port I reported in my letter dated the 6th instant. His name is François Garnier, and he styles himself "Lieutenant de vaisseau, chef de la Mission scientifique du Mekong." He was originally second in command, but his superior officer unfortunately died in Yunnan. He did not seem inclined to be communicative as to the objects or results of the expedition, but he furnished me with the following particulars in regard to his route:—The mission, consisting of the Captain in command, himself, another Frenchman, and a small body of Cochin Chinese and Manila men, left Saigon two years and five days ago, and proceeded up the Meh-kong, or Cambodia River, called by the Chinese San-toang-kiang. They ascended its stream until they reached Kiang-hung outside the border of Yunnan Province, when they branched to the right, and passed, via Estnek, Puweh, and Yuen-Kiang, to Lin-gun-fu. Thence they travelled through Yunnan-fu, the capital of the Province, to Tung-chuan, a town close to the head of the Kin-sha-kiang or Yang-tse-kiang, where it forms part of the northern boundary of Yunnan. There the Captain in command was left, being too ill to proceed, and they then ascended the stream of the Kin-sha as far as Ta-li-fu, intending to revisit the Lan-tsang-kiang and explore its higher waters. But the Mahomedan rebels whom they found in possession of Ta-li-fu, and the neighbouring country, prevented them from carrying out this intention, and proved so generally hostile that they were compelled to retrace their steps to Tung-chuan, which they reached after two and a half months' absence. The Captain had meanwhile died; carrying his remains with them, they again started, and followed the downward course of the Kin-sha until they reached Hankow.

Lieutenant Garnier tells me that they experienced no molestation nor opposition worth mentioning, except from the Mahomedan rebels, as above mentioned; but that on the other hand, facilities were very grudgingly afforded them by the constituted authorities in those portions of China which they traversed. He describes the privations which the party suffered from time to time whilst threading the trackless forests and uninhabited tracts of country between China and the neighbouring States, as something very terrible, and he considers it very improbable that any considerable line of traffic could ever be established through that part of the frontier which he has had the opportunity of examining. The only information I could gather from Monsieur Garnier on the subject of the navigation of the Yangtze was, that he considered the river easily navigable for steamers as far as Ma-hu-fu in Szechuen, and that its rapids were not by any means so formidable as those on the Meh-kong River.

He reports the greater part of Yunnan and Szechuen (west) as being in a very disturbed state.

June 9, 1868.

W. H. MEDHURST.

3.—*Earthquake Wave observed at Samoa, Navigator's Islands, on the day of the Earthquake in Ecuador, 1868.* By the Rev. Dr. GEORGE TURNER.

(Communicated by W. LOGAN, Esq.)

EARLY on the morning of Saturday, the 15th of August, 1868, an unusual oscillation of the ocean made its appearance along the north side of Upolu. About 2 A.M. during fine weather and in a perfect calm, and at the time of high water, first one, and then a second and higher wave came rolling in. Just at this place, and at similar projective points well protected by the outer barrier reefs, the perpendicular height of the largest wave did not exceed 2 feet 9 inches above the level of high-water mark. But in some of the deep bays and narrow inlets less protected, where it concentrated and raised the shallower waters in its course, it rose to an immense body of water 20 to 30 feet high, and burst in upon the villages, like an invading army, as a native described it, carrying everything before it. In one place, where the roofs of houses were lifted on to the tops of breadfruit-trees 25 feet high, the poor terror-stricken people woke up in the dark, with boxes, bedding, &c., flying about in all directions—the house over their heads carried away altogether or tumbling down about them—and themselves being carried they knew not whither. Some found themselves up among the leaves of the coco-nut trees, and there they held on and swung for a time, others were rolled about and washed away to the taro swamp behind the settlement, and one poor woman with a child at the breast, another in her other arm, and a third on her shoulders holding on by her hair, was thrown up among the thorny branches of an orange-tree. In her struggle to get clear she lost two of her children, and only saved the one who held on by her hair. In two of the villages in that bay only two houses were left standing, and four children were drowned. In another settlement, ten miles further to the east of that place, fourteen houses were carried away, and goods and chattels scattered all over the land and up and down the lagoon. The poor people, and especially the teachers, principally mourn over the loss of their books.

The swell soon subsided, but for hours during the morning and early part of the day a slight oscillation was observed, and between 9 and 11 A.M. there was a distinct rise and fall of the tide eighteen times. No unusual colour or odour was observed here; but, about 40 miles to the eastward, the natives say that the waves dashed on the shore at early dawn with an unusual bloody colour. The swell came from the west and seemed to go eastward, at the rate of about 30 miles an hour.

The oldest natives do not remember anything so sudden and alarming. They remember a similar one in November, 1837, but that was in the daytime, and the people were awake and had time to get out of the way and prevent loss of life. Subsequently, it appeared that on the same day there was a distinctive earthquake along part of the west coast of America, and contemporary with it, a wave, 20 feet high in some places, burst in on the Sandwich Island coast and did a deal of mischief. On the 29th September, 1849, slight oscillation was again observed here and in the New Hebrides group, but nothing of the kind has been noticed since. We have noted the 15th of last month, and expect to hear of some submarine disturbance having its centre somewhere between this and Tonga or Feejee.

Sept. 14, 1868.

4.—*Notes of a Journey among the Woolwa and Moskito Indians.*
By G. H. WICKHAM, Esq.

(EXTRACTS.)

At daybreak on the 5th November I started for the Blewfields, or, as it is sometimes called, the Woolwa River (from the Indian tribe which inhabits its banks). The river flows into the northern extremity of the Lagoon, by many mouths lined with mangrove thickets, now destroyed, like everything else, by the late hurricane.

For my journey I had engaged a large pit-pan, or river canoe, and three men, Nach (head man), his son, and a mixed Mosquito man called Teribio, who was going home to his Woolwa wives (of which he had two) at Kissalala.

The course of the river is exceedingly serpentine. We reached the first Woolwa settlement, called Kissalala, and climbing the steep bank came to the first Indian lodge. I found myself in what appeared quite another world of manners and customs, and which made a strange impression upon me, such as in all probability I should never feel again. The inmates, however, apparently took little notice of me further than to motion me to one of the low cedar stools, and then left me to make myself at home. The women, in their decidedly light apparel, continued to busy themselves at the fires, from time to time stirring the contents of their large pots with long-handled wooden spoons; the men went on tipping their arrows and carefully testing their straightness and balance by looking along them while held at arm's length. They said that a sea-captain once came up the river as far as this place. They described him as having taken a sketch of the lodge, with the women in the act of grinding corn.

It seems probable that the curious custom of flattening the forehead, which so largely prevails among the aboriginal American tribes, had its origin in a desire to increase the characteristic formation of the head, which they would naturally enough consider the highest type of beauty. The Woolwa, however, does not practice this fashion to the extent that some other of the American tribes do, and their hair, worn hanging to the eyebrows in front, grows so thickly that a casual observer would hardly notice any unusual flatness in the skull. It is interesting to observe the effect produced by modes of living on the figures of the different tribes and races of man. Among the Woolwas I noticed large developments about the arms and chest, while the lower part of the body was often inclined to be squat. This is without doubt caused by spending most of their time, as they do, in paddling, poling, and hauling their canoes up the creeks and rapid rivers of their country. Indeed, they are essentially canoe-men, as the "civilized" Indians in the district of Matagalpa are pedestrians.

The Woolwa places of burial are always in the vicinity of the river-banks, and are marked by a large thatched shed similar in its construction to the lodges inhabited by these Indians. This is built over the place of interment, and the whole place is sedulously kept clean of bush growth.

These Indians have a curious mode of playing with staves or short poles. They take these poles and grasp them in the centre, and standing opposite each other hold them at arm's length, striking each end alternately together with all their force. They are matched in pairs, and in appearance it puts one in mind of the old English quarter-staff play. The object of the game is to see who can keep up the continual strain upon the muscles of the arm longest, and ultimately strike the staff from the hand of his opponent.

The Woolwas have many strange customs attendant upon their coming of age. The young men have to pass through many physical ordeals before they are fully admitted to the privileges of man's estate. Among other ordeals they have to sustain heavy blows on the back, given after their manner with

the elbow. This, although well enough for the strong, must press heavily upon the weak. The rest are of a similar character; their main object being, seemingly to ascertain what amount of physical suffering they can endure. It seems probable that these customs are but the remnants of more useful exercises, calculated to ensure them to suffering, and to strengthen and educate their bodies in the art of war, at a time when they were a more numerous and warlike people than they are at the present time. These Indians must be expert swimmers, as they usually bathe several times in the day; but an opportunity of observing them rarely occurred, as when either the men or women wished to bathe, they went down to the landing-place where their canoes were moored, stepped into one and dropped down the stream to some secluded spot where they could go through their ablutions unobserved.

The Woolwas seem now to have no chief of their own. They go to Blowfields to settle any little difficulties that may arise, which is not often the case, nor have they villages, of any size, but live in lodges, two or three grouped together, and scattered at intervals along the main river and its tributaries. These lodges have no walls, but are open on all sides. The thatch has generally a neat appearance, especially from the inside, and is generally decorated with the lower jaw-bones of the peccary and warry or wild hog, &c., and also the bleached skulls of large fish. Sometimes there are stages made of split bamboo for storing away dry maize, &c., and bows and arrows (the only weapon which they now use of their own manufacture) are stuck into the binding of the thatch. A wretched old gun or two obtained from the traders in exchange for their canoes or india-rubber, &c., an axe and a few rusty machetes, stones for grinding corn, their own earthenware pots, which are decidedly picturesque in shape, and in which they cook their food, and perhaps a cast-iron one obtained from the traders, some odd-looking little bags suspended under the eaves with pieces of native cloth hanging on the supporting beams; a cradle with the dried claws of crabs and other things attached to it, making a strange rattling noise when it is rocked, often heard at night when all else is still, and a few stools, complete the furniture. There are generally three or four families in each lodge, each having their fire in one of the corners, at which they cook their own plantains, &c., and round which they sit and chat. There are generally a set of the most wretchedly miserable-looking curs that can be imagined on the look-out for what they can steal. The Indians are very fond of taming wild animals for pets. You rarely stop at a village where you do not see parrots and parakeets, monkeys or tame waray or peccary. At one place I saw a little boy running about with a tame otter, here called "water-dog."

The following day we went on to the next settlement of Woolwas, a small village of about four families. Passed two rapids, at one of which we had to take out the things and haul the pit-pan over. The Indians were very civil, knocking down the ripest oranges from the trees, and doing many other little things to please us. I passed the night here, and next morning started up the river again. Next morning we dropped down the river as far as Kissalala, and passed some time in this place.

During the wet weather the Blowfields River rises with astonishing rapidity, and the current becomes very swift and turbid, bearing along with it logs and trees. At such times the upper part of the river becomes quite impassable, boiling and seething as it does over the huge boulders which block up its bed.

The women had been preparing mishla for some days past. The preparation of this drink is a very disgusting process, but is, I believe, in some way connected with their religious belief, whatever that may be. I have been led to think that this is the case from there not being the same jolliness that there is when they hold their carousals, with drinks made from bananas and sugar-cane, and others of that nature. Mishla is a general name for all kinds of drink; but unless some other name is affixed, it is generally understood to mean that

made from cassada. When they intend giving one of these feasts or ceremonies, the whole community club together and collect a large quantity of cassada, which they then set about chewing, spitting it afterwards into one of their large earthen pots; when their jaws get so tired that they are obliged to disist they boil the remainder, and after mixing the whole together let it stand for a day or so until it has fermented, keeping it stirred and skimmed. People are invited, and come from a great distance to attend these "drinks." They are then to be seen in their full costumes of paint, feathers, and beads, some of them wear a sort of coronet made from the curly head-feathers of the curassow, which often looks very tasteful. A cord around the upper arm, to which are attached feathers of the macaw, downy owl, and the yellow tail-feathers of the *Éténops Montezuma*. Around their necks the men wear the small opaque beads they get from the Blewfields traders, worked by themselves into long pendant bands, often of very pretty patterns. These hang down in front of the body, with tassels of white beads fastened to a broad collar (of similar work to the bands which hang down the back. The "townoo" or "palpra," as the Moskitos call it, is a cloth worn by the men round the waist; the ends hang down between the legs, generally below the knee; in some of the young dandies it reaches to the ground. The "townoo," like the sheeting in which they wrap themselves at night, is made of the bark of a tree beaten out by the women on a smooth log with a mallet shaped like a club, the grooves of which give it a texture and the appearance of a mash; the women also make them sometimes of a very stout and handsome cotton material, dyed with many colours, woven into tasteful patterns; sometimes they mix it with the down and feathers of birds. These do not seem to be used often now, probably from the time and labour they take in the making. The women on full-dress occasions wear a great quantity of beads round the neck; but, unlike the men, they do not work them into designs, simply taking the bunch as they get it from the trader, and fastening the ends behind the neck. They must be greatly inconvenienced on full-dress occasions; at such times I have seen the young women with such a mass of beads of various colours round their necks as to occupy the whole space from the bosom to the chin, and quite to prevent their turning the head. The women wear a petticoat reaching below the knee, made of either their own bark-cloth or gaily coloured printed cottons obtained from the traders, which they wrap round their loins, tucking it in on one side above the hips. When dressed to receive company, they make the upper part of the body a deep vermillion,—a colour obtained from the pod of a kind of shrub in which it is found between the seeds. When required, it is taken out and collected in a little calabash ready for use. They use it by simply rubbing it into the skin, to which it imparts a soft and glossy appearance. They do not paint the face in broad bands of black and red streaks and blotches like the men, but have three or four fine lines drawn very evenly across the nose and cheeks under the eyes on the vermillion ground. I once saw a Woolwa at Kieselala, who had his hair dressed in a very curious fashion. It was tied and bound up behind in very much the same way as the old European "queue." I notice this, as it was the only time that I saw the mode among the Indians. On the present occasion, the Indians were drinking mishla all that day and the next, as it is their custom to leave none untouched. Another thing that makes me think that this kind of drinking is a religious ceremony, is that one of the party goes round the circle from time to time singing a sort of monotonous chant and beating a kind of drum, formed from one of the joints of a large bamboo, another accompanying him with a large sort of flute made from a small bamboo.

On the morning of the 14th I started for the Rama branch, which is about an easy day's journey from this place, in a dory with a young Woolwa from the upper settlement. We entered the Rama mouth early next morning. The view was pretty. We kept on till late in the afternoon without seeing a

place to camp, the banks being everywhere very low, with nothing but bamboo thickets thrown into great confusion by the hurricane. A short distance up, the Rama there is a very remarkable conical-shaped hill standing some distance back. The Indians call it Assanuka.

Next day we kept on some distance further, but the current became very strong. About this part there is on the left bank an abrupt cliff of rock rising perpendicularly from the water, which appeared very deep at its base. The Indian settlements on this river are few in number, very high up indeed; the lower part is altogether too low for the Woolwas, who love to build their houses on the high banks above their rivers. Two days afterwards we returned to Kissalala. Shortly after, I recommenced my journey up the main river.

On the morning of the 30th we arrived at a place where the river is quite blocked up and lost to sight among great stones fallen from the side of a rocky hill. Here we had to carry pit-pans and everything over the hill by a long and steep but well-worn portage-path through the forest, striking the river again on the other side as it emerged from the obstructions in a rocky gorge. This was densely covered with vegetation, as indeed is every part of this river's course. After making one more portage we came to an Indian settlement; they gave us some cassada, and after bidding them adieu we camped further on.

Next day we passed an exceedingly difficult part of the river, and came to the place called the "second hill," where the river was again entirely lost amid the immense rocks. The portage-path was a very pleasant one, leading through the shady woods. It is noticeable that where a portage is much used the cavities in the rocks are filled with cedar shavings, some old and some fresh, scraped off the bottoms of the pit-pans by the rough surfaces of the stones. On arriving at the river on the other side of the hill we cooked our dinner on the gravel bank formed at the mouth of a shady little creek which here joins the river. This secluded little stream, called Billwass, was pointed out to me as having Woolwas living up it; and on many similar occasions I have noticed the predilection which these Indians seem to have for living far up little out-of-the-way creeks.

We again pushed on, and although the river still continued very difficult, its bed being quite filled with rocks, we reached a settlement which I afterwards learnt is called Woukee. It is so called from its being situated at the foot of the falls of that name, part of which is visible from the lodges. This is decidedly the prettiest settlement on the river, both from its situation, from the manner in which the houses are built, and the planted grounds around them kept. Besides the universal "Sapa" palm, which when seen on the banks among the forest always marks the site of an old settlement, and others usually seen among the Woolwas, they had a good deal of chocolate and cotton, a fine bread-fruit and other fruit-trees. The old man, who seemed to be the patriarch of the place, was lame in one of his legs from the effects of a snake-bite. He said he had been much worse, but was now fast recovering.

We left Woukee next morning; the other men had already taken the pit-pans and their loads over the succession of rapids and falls above the settlement, beyond which they awaited us. To join them we had to walk along a rugged track, skirting the forest, with sharp pieces of rock cropping out of the ground in all directions, and over fallen trees, now again by the water's edge climbing from one mass of water-worn rock to another, until we at last reached the canoes.

On the 7th we arrived at a place called Ka-ka. Temple said the Woolwas told him that this was the last settlement of their tribe on this river. This I very much doubt, for although the river had become a small stream, yet there must have been for a considerable distance further a good deal more water than in many of the creeks inhabited by them which flow into the river lower down. Ka-ka is a pretty little place, lying bedded as it does in the surrounding

woods. On the opposite side of the river, which is here narrow, there was an especially beautiful wall of verdure; the tall straight shafts of the tree-trunks and limbs appearing at intervals between the varied foliage, pretty flowering vines, caught up here and there in festoons or hanging down in waving tresses, the snake-like coil of the tough bush-ropes and the elegant fronds of a palm, occasionally breaking the outline of foliage. On one side of the lodges there flowed into the river what at home would be called a trout stream, the same slabs of rocks, the same deep pools, little falls and brawling shallows; but here the elegant palm, occasional tree-fern, and many other strange forms of vegetation only known to the tropics, overhung the glancing water, and from the green walls that shut the stream in on either side, and through which only an occasional refracted beam of sunlight could find its way, came the strange cries of the parrots, toucans, trogons, and other birds whose notes harmonised well with the scene. At this place there was the largest plantation of sugarcane I had seen in the country. These Indians make a very palatable kind of sugar, which they mould into cakes and eat with their plantain and baked cassava.

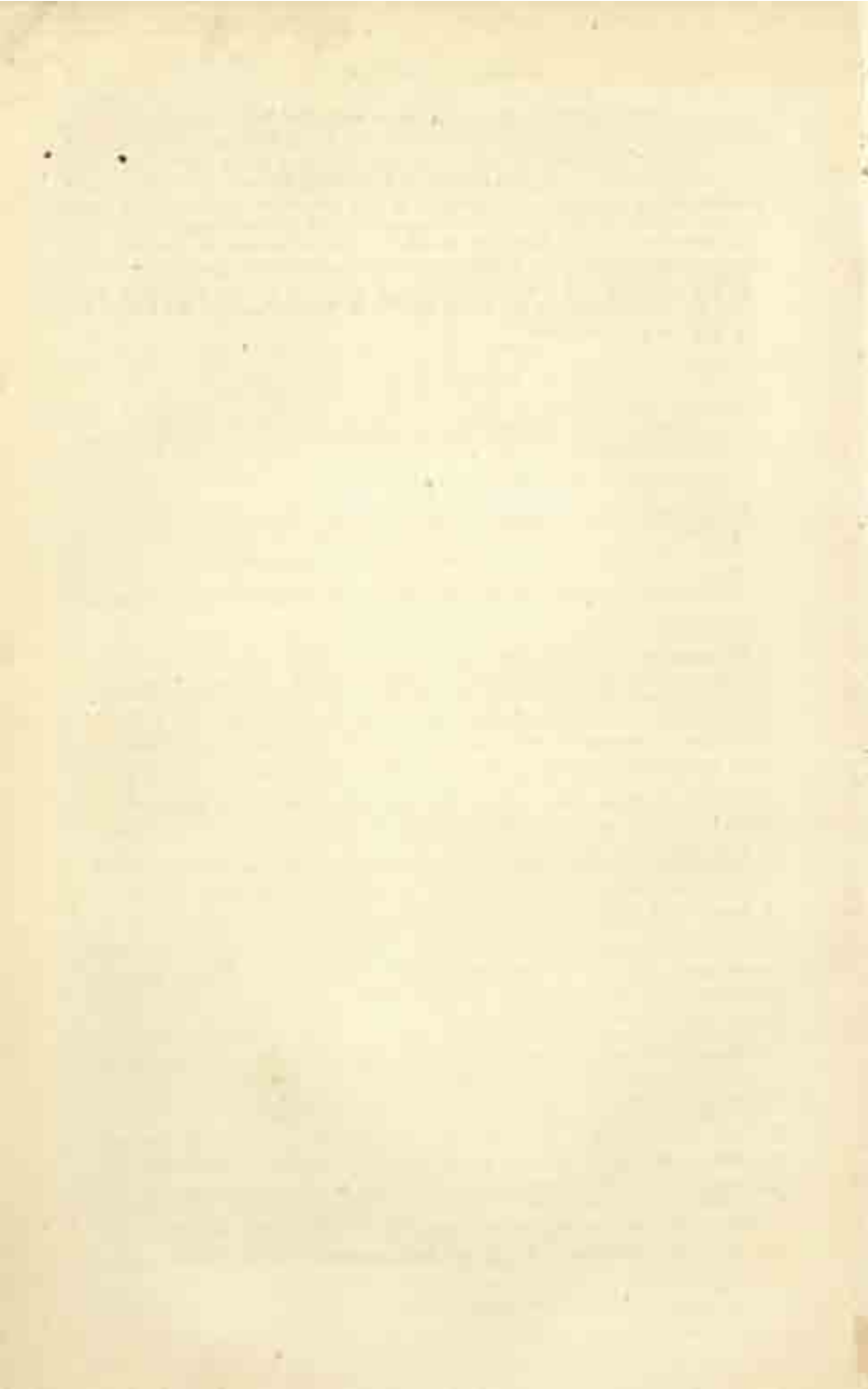
On the 9th, Temple and I started for Consuelo. The track, which was very faint in some places, led through a damp and gloomy forest crossing a creek several times, thence up the side of a steep hill covered with tall trees, closely intermixed with some of a shorter and thicker growth; saplings and dwarf palms, the whole bound together here and there with bush-ropes. It was impossible to get any view of the surrounding country until we got to the very top, where there was a small opening with a little grass. Suddenly emerging from the tangled forest, a good deal exhausted by the wearisome climb, having often to creep under or climb over trees and branches that had fallen across the track, we came unexpectedly on a view of great extent and beauty. The plain beneath stretched far away, with hills of different elevation, to distant mountains. The day was so unusually clear that the Indians pointed out on the distant slopes the savannahs, which could be distinguished by their light brown tint. These, they told me, were the mountains and savannahs of Matagalpa. I never afterwards had an opportunity of getting a clear view from this eminence, as on subsequent visits there were always mists and vapours hanging about the forest-covered sides of the hill.

Animal life seemed scarce in these woods; we only met one snake, and that a small insignificant brown little fellow, but the Indians seemed to dread it a good deal, as they took the trouble to cut a long stick, beat it to death, and throw it out of the path before they would pass the spot. After leaving the open space on the summit, we did not take long in going down the steep descent on the other side, which led to a narrow valley evidently but recently cleared of its timber. One thing that surprised me during the fatiguing march through the forest was that the sun was always before us, by which we knew that we had been going nearly due east since leaving Ka-ka. This surprised me, because I had formerly thought that all the settlements in Spanish country lay due west. We stopped to make enquiry at the first hut we came to after leaving the woods. We were surprised to find that this place was one of the Chontales mines, having previously imagined from the map I had seen that the course of the Bluefields River would have carried me far north of these. The people also appeared exceedingly perplexed at seeing me emerge from the forest with Temple and several Woolwas behind. They were so shut in by the forest-covered hills on all sides that they never dreamt of the possibility of any one arriving among them, except by the road from the Lake Nicaragua through the town of Libertad.

Captain Pina, *R.N.*, arrived on a visit to Chontales whilst I was there. He seemed to entertain, with Dr. Seemann at the Javali mines, the idea of opening communication with Bluefields by means of a mule-track through the forest to Kissahala, and thence by means of a small craft on the river, the river being,

as I assured him, quite free from obstruction until just below that place. This, of course, would be a great saving of distance; for, as it is, all communication with the coast must pass-by way of Lake Nicaragua, the San Juan River, and Grey Town. If this be accomplished, the Nicaraguans will probably make a push to obtain possession of Blewfields, as they did before in the case of Grey Town. It is to be hoped that the Government of England would deal more honourably by our old Mosquito friends than was the case in the treaty of 1861, of which, whenever it was mentioned (for the natives frequently questioned me about it), I felt very much ashamed.

On the 23rd March, in the afternoon, I left Santo Domingo for Ka-ka, on my way back to the coast.



PROCEEDINGS

OF

THE ROYAL GEOGRAPHICAL SOCIETY.

[ISSUED APRIL 17TH, 1869.]

SESSION 1868-69.

Fourth Meeting, 11th January, 1869.

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT, in
the Chair.

PRESENTATIONS.—*J. A. Brand, Esq.; W. T. Palliologus, Esq.; J. Seaton, Esq., M.D.; F. C. Cory, Esq., M.D.*

ELECTIONS.—*T. R. Auld, Esq.; George Bidie, Esq., M.D.; J. H. Bouker, Esq.; Dr. Barry, M.A.; Alfred Drummond, Esq.; Francis Drake, Esq.; G. Goldney, Esq., M.P.; W. H. Hodgson, Esq.; George Holt, Esq.; Samuel Heywood, Esq.; Hon. E. W. Lamb; G. E. Massie, Esq.; Robert Nicol, Esq.; F. G. H. Price, Esq.; F. A. Page, Esq.; Hormuzd Rassam, Esq.; Dr. J. L. Stewart; John Sarll, Esq.; E. C. Stebbing, Esq.; Robert O. White, Esq.*

ACCESSIONS TO THE LIBRARY BETWEEN THE 14TH DECEMBER, 1868, AND 11TH JANUARY, 1869.—*'Della Laguna di Venezia.'* By B. C. Vacani. Florence, 1867. Donor, the author. *'Florula Discoana.'* By R. Brown. Donor, the author. *'W. C. Plowden's Travels in Abyssinia.'* By T. C. Plowden. Donor, the editor. *'Les Cataracts du Nil.'* By E. Gottberg. Paris, 1867. Purchased. *'Das Sudliche ufer des Kaspischen Meeres.'* By G. Von Melguno. Leipzig, 1868. Purchased. *'La Géographie du Talmud.'* 1868. By A. Naubauer. Purchased. *'Géographie de la Palestine après les Thalmuds.'* 1857. By J. Dorenbourg. Purchased. *'Egypt et Nubie, 1867.'* By J. J. Ampere. Purchased. *'L'Arabie Contemporaine.'* By A. D'Avril. Paris, 1868. *'Ceylon, 1868.'* By Von Ransonnnet. With Transactions and Reports of Societies.

ACCESSIONS TO THE MAP-ROOM SINCE THE LAST MEETING OF DECEMBER, 14TH, 1868.—Ordnance Map, on various scales, 958 sheets. Area Books, 84 inch.

After the reading of the Minutes of the previous meeting, the President spoke as follows:—

"Before the ordinary business of the meeting commences, I feel it to be my duty to express to you the grief which I have experienced, in common, I am sure, with yourselves, on the occasion of the sudden death of our esteemed and distinguished associate, Lord Strangford. The great services which his Lordship has rendered to the Society are well known to you; and the deep regret which I am sure you will feel at his loss must be aggravated when I tell you that at our very next meeting Lord Strangford would have communicated to you, *ad hoc*, the result of all his researches into the geography of Central Asia—a task which he was so eminently qualified to execute with success, from his wonderful lore in all writings on the subject and his intimate acquaintance with Eastern languages.

"In anticipation of the reading of this excellent paper, when he who was to have eloquently expounded it is in the grave, I call on you to unite with me in a vote of our heartfelt condolence towards the afflicted widow, who, as the daughter of that eminent geographer, Admiral Sir Francis Beaufort, in her father's lifetime gave full proof of her attachment to our science, and who frequently honoured us by frequenting our assemblies."

(This expression of sorrow and condolence was cordially and unanimously approved, and the President was requested to convey the sentiments of the Society to Viscountess Strangford.)

The President then announced that the Council had selected as examiners for the medals offered for competition by the Society to the public schools, the Rev. William George Clark, Vice-Master of Trinity College, Cambridge, and Mr. Alfred Russell Wallace, the eminent naturalist and traveller. The head masters of the public schools had responded in cordial terms to the invitation of the Society; and he had every reason to expect that this system of awarding medals to the most proficient scholars would prove an important and enduring stimulus to the study of geography. The examination would take place on the first Monday in May. The President added that he could not make this announcement without stating that the scheme originated exclusively with Mr. Francis Galton, a member of the Council; and the Council had adopted it in the belief that it would be appreciated as one of the best means for the promotion of geographical knowledge throughout the country. The warmest thanks of the Society were due to Mr. Galton for the part he had taken in the matter.

The President then introduced Mr. Douglas Freshfield, Mr. Moore, and Mr. Tucker, three English gentlemen, who have recently made a remarkable exploration of the Caucasus, and who had ascended two of the loftiest mountains of the range—Mount Elbrus, which is 2800 feet higher than Mont Blanc, and Mount Kasbek, which is 16,546 feet above the sea-level. The President said he must call them the two highest mountains in Europe, because they were situated on the northern side of the Caucasian chain, which had been considered by modern geographers the boundary between Europe and Asia. Mr. Freshfield would read his remarkable account of the journey, and of the difficulties he and his companions encountered, and how they obviated them.

The following paper was then read by the author:—

Journey in the Caucasus and Ascent of Kasbek and Elbrus.

By DOUGLAS W. FRESHFIELD.

THE author stated that the journey to the Caucasus was made by himself with two friends, Mr. Tucker and Mr. Moore, accompanied by

Francis Devouassoud, of Chamounix. The main object of the visit was to explore the mountain-chain, and to ascend, if possible, some of its highest summits. The party started from Tiflis, on the 26th of June, 1868, having there received from the Russian authorities such assistance as could be rendered, and they noted their thanks especially to General Chodzko, the officer under whose direction the five-verst ordinance map was executed; they also acknowledge the assistance they had received from Herr Abisch and Herr Radde.

The new Dariel road was nearly completed; though well constructed, it is not equal in point of engineering to the best Swiss or Austrian highways through the Alps. On the south side of the chain the scenery is pretty without being grand, and recalled part of the German Tyrol. The valley of the Terek, on the north side of the pass, is of an entirely different character; treeless glens, bold rocks, slopes of steepness forbidding even to eyes accustomed to those of the Alps, and stone-built villages, scarcely distinguishable from the neighbouring crags; such are the main features of the 16 versts' drive from Kobi, the highest station in the valley of the Terek, to the village of Kasbek. The observant mountaineer will previously have caught several glimpses of the summit of Mount Kasbek, but it is only on reaching the station that the magnificent mass is fully seen, towering thousands of feet above its neighbours, in the form of a steep-sided dome of snow, broken by masses of crag, the uppermost of which—a horse-shoe in form—is conspicuous in most views of the mountain from the east. From the earliest times Kasbek has taken a place in history, and has, somewhat unfairly, robbed its true sovereign, Elbruz, of public attention. Situated beside, and almost overhanging the glen through which for centuries the great road from Europe to Asia has passed, it forces itself upon the notice of every passer by, and the traveller, who if blessed by a clear day, sees Elbruz only as a huge white cloud on the southern horizon, as he jolts over the weary steppe, is forced to pass almost within reach of the avalanches that fall from his more obtrusive rival. It is therefore not difficult to see why Kasbek has become famous: why in early times the mass of crag on the face of the mountain, so conspicuous from the post station, was made the scene of Prometheus' torment, why in later times superstition has declared that amongst these rocks, a rope, visible only to the elect, gives access to a holy grot, in which are preserved the tent of Abraham, the cradle of Christ, and other sacred relics.

The ascent of Kasbek was commenced on the 30th of June, the party

bivouacking at the height of 11,100 feet. The weather, after sundry fluctuations, settled fine. At 2:45 A.M., on the 1st July, the ascent was resumed, the travellers fully enjoying the moonlight view of the grand circle of ice-mailed peaks around them, and the glorious sunrise flush which succeeded it. Climbing the left side of the glacier, which was but little crevassed, they rounded the base of the east flank of Mount Kasbek. Arrived at some rocks, where a tributary glacier joins the main stream, they halted to put on the rope, before turning up the face of the mountain. Ascending at first by rocks, afterwards by broken slopes of *nevé*, they gained height rapidly. At 6:30 A.M. they were at 14,800 feet above the sea, and only 1800 below the top.

Some fine peaks, which they afterwards knew as the Adai Kock group, were conspicuous to the west, the view being magnificent and perfectly clear. To the south the eye already ranged over the main chain of the Caucasus, across the valley of the Kur to the hills beyond, while behind the rugged ridges which rise on the east of the Terek valley, the peaks of Daghestan raised their snowy heads. From this point to the summit, numerous crevasses had to be crossed or rounded, and in passing one of them Mr. Tucker slipped, but the others remaining firm, and the rope holding, he regained his foot-hold. For four hours before reaching the summit, the ascent was by a slippery ladder of ice, to which they had to cling with knees and ice-axes, as well as hands and feet, exposed to a furious wind, which drove showers of snow and ice in their faces. At 11 A.M., they gained the saddle between the two summits; the final climb up the eastern and highest peak was not difficult. They cut up a bank of hard snow, scaled some rocks, then found themselves on the snow cupola which crowns the mountain; up this they mounted, until the ridge ceased to ascend, and the highest summit of Kasbek (16,546 ft.) was reached. The valley of the Terek, was partially hidden by the clouds, which not only covered the great northern plain, but also filled the valleys of the mountain-range. They were surprised by the apparent grandeur of the eastern chain, where group after group of snowy peaks stretched away to the far-off Basarjusi (14,772 feet), the monarch of the Eastern Caucasus. Nearer and more conspicuous was the fine peak of Schobulos (14,781 feet). In the distance they sought for Elbruz, but found it not; whether veiled by clouds or hidden behind the projecting masses of the Gotschtantau group, they could not say. They fancied afterwards that they recognised Kasbek from Elbruz; the converse, of course, is possible, but the distance between the two mountains is 120 miles as the crow flies. The descent by a different slope

was long and intricate, but not difficult, and the banks of the torrent flowing from the Dvvdorah glacier were reached 7.45 p.m.* Here they slept under a rock with some goatherds, and found their way by the defile of Dariel to Kasbek village the next morning. In the evening the porters, who had supposed them lost, returned, and their account of the achievement created great excitement in the place; the villagers expressing their congratulations by hugging and kissing the successful mountaineers. The travellers effected the journey from Kasbek to Elbruz (120 miles in a straight line) by the upper valleys of the streams which flow from the glaciers of the central ridge. Many of these valleys are troughs lying parallel to the direction of the main chain. The plan of route, after leaving the post-road at Kobi, was to ascend the Terek to its source, cross to the Ardon, descend the east, and mount the west branch of that river; traverse the main chain of the Mamisson Pass, and then work along the upper valleys of the Rion and Ingur, making their way across the sources of the Tzkenis-Tequali, between them. From Pari, the Russian post in Suanetia, they proposed to cross the chain to the Baksan valley on its northern side, at the foot of Elbruz. This journey took four weeks to accomplish. As far as the Mamisson Pass, the characteristic of the scenery is savage grandeur. The natives are Ossetes, a tribe famed for their personal appearance, and the picturesque richness of their costume; their language is the most nearly allied to Sanscrit spoken on this side of the Indus. They have been converted to a nominal Christianity.

From the Mamisson to the Nachar Pass west of Elbruz, the watershed runs north-west and south-east, in a straight line for a distance of 100 miles, without any break of less than 10,000 feet; covered throughout with glaciers, and studded with peaks which average from 14,000 to 16,000 feet in height. The slopes of the Rion basin are clothed with magnificent pines, which are not here, as in the Alps, the highest trees; above them is found a zone of birch, terminating at 7500 feet, the upper limit of forests in the Caucasus. A dense undergrowth of rhododendrons and azaleas adds to the beauty of the sylvan scenery. The inhabitants are a poorer race than the Ossetes, but more kindly disposed towards strangers. From the Rion valley the party made an expedition over the glaciers to the north side of the chain and back, leaving their interpreter and luggage at Gebi. The pass made by them for the first time, on their return, led up the icefall and over the snow-fields of the great Karagam glacier, and equalled in difficulty and scenery any of the great glacier-passes made during the last few years in Switzerland.

They were three days traversing the network of glens containing the sources of the Tzkenis-Tsqali, which are uninhabited. The distinguishing feature of the country is the extraordinary rankness of the herbage, brought more home to travellers by the absence of path, which compelled them to force their way through the forest. Once descended from the ridge separating the Rion and eastern Tzkenis-Tsqali, they were either entangled in dense thickets or waded in the glades through vegetation always up to their shoulders, and often above their heads, consisting of hemlocks and other weeds, interspersed with gigantic tiger-lilies.

Suanetia, or the Upper Valley of the Ingur, is, both as regards its scenery and inhabitants, probably the most interesting district of the Caucasus. A large basin, 40 miles long by 15 broad, is encircled by glacier-crowned ridges, and divided into numerous wooded gorges and meadow-basins by lower spurs. It is accessible from the outer world only by a narrow, and at times impassable ravine, or by lofty mountain-passes. The upper glens harbour the most savage and untameable of the Caucasian races, and are, in fact, a sink of iniquity, where robbers and murderers—who have made their own homes too hot to hold them—find refuge. The hamlets are grouped in clusters, each of which is a fortress, the houses being built of stone, with slits for windows, and surmounted by towers. At Jibiani, the highest Suanetian village, fear of the unknown power of English revolvers alone deterred the natives from carrying out their threat of plundering the travellers.

West of *Pari* the *Nakra* valley runs north into the heart of the chain, and a pass about 10,800 feet in height leads from its head to the *Baksan* valley on the north side of the watershed. At *Uruspieh*, the highest village in the valley, the Mahomedan princes were very hospitable; they are of a Tartar race, which inhabits the upper basins of the *Baksan*, *Tsohegem* and *Tcherek*.

On the 29th of July the party left *Uruspieh* to ascend *Elbruz*, and slept in a glen closed by one of the glaciers descending from the mountain. On the 30th they climbed the slopes on the true right of the glacier, and pitched their tent on some rocks at a height of 11,900 feet; 500 feet below the great *nevé* plateau, which spreads round the base of the mountain, the summit of which resembles in shape an inverted tea-cup. The night was intensely cold. A little after 2 o'clock on the morning of the 31st, they resumed the ascent. Severe biting cold and a high wind rendered the climb extremely toilsome; but they met with no difficulties formidable to a practised mountaineer, and reached the top (18,526 ft.) at 10:40 A.M., accompanied by two natives of *Uruspieh*. They visited the three highest

points of the horse-shoe ridge (enclosing what appeared to be an old crater), which forms the summit, and built a stone man on one of them. To the south and east the view was cloudless, and they could see the mountains of the Turkish frontier between Batoum and Achalzieh. The Pennines from Mont Blanc cannot compare to the central chain of the Caucasus, as seen from Elbruz. The Caucasian groups are finer and the peaks sharper.

From Uruspieh the party descended in two days to Pätigorsk, the Russian bathing-place, on the north side of the Caucasus, where mineral springs abound.

Re-entering the mountains at Naltobik, they penetrated to the glaciers at the source of the Tscherek (to be distinguished from the better known Terek). These flow from the east flanks of Gotschtantau, 17,000 feet, and Dychtan, 16,900 feet—the Caucasian summits next in height to Elbruz. They crossed a high pass into the Uruch Valley, which they descended to Ardon, where they rejoined the post-road two stages from Wladikafkas. The gorges through which the Tscherek and the Uruch have forced a way out to the northern steppe are of the most magnificent description. They are deep trenches, cut down from the tops of the mountains to a depth of 5000 feet, and the fine timber which clothes every ledge between the precipices adds much to the grand effect of these defiles, which are unequalled in the Alps.

From Wladikafkas they returned by the Dariel road to Tiflis, and thence journeyed to Kutais by Borjom and Achalzieh.

In conclusion, the author made some remarks on the paragraphs which had appeared in the '*Allgemeine Zeitung*' and '*Pall Mall Gazette*,' asserting Kasbek and Elbruz to have been previously ascended by German savans. He referred to the works cited as authorities for these statements (Herr Wagner's '*Kaukasus in 1843-4*,' and Kuppfer's '*Voyage dans les Environs d'Elbruz*'), and proved from them that the authors made no claim to have reached the summit of either mountain.

Mr. Freshfield also drew attention to the controversy lately raised as to the limits of Europe and Asia; and stated his opinion that the boundary line afforded by the watershed of the Caucasus, and adopted by Keith Johnson, McCulloch, Blackie, Hall, and other modern geographers, is the best possible. Kasbek and Elbruz both lying north of this watershed are therefore European mountains.

The paper will be printed entire in the '*Journal*,' vol. xxxix.

The PRESIDENT, in expressing the thanks of the Society to Mr. Freshfield, observed that the exploit which he had recounted did great credit to the English nation; none but trained Alpine travellers could have accomplished it. Englishmen had been ridiculed for their enthusiasm in exploring the highest

peaks of the Alps, which, it was said, was risking life for no useful purpose. But he maintained that these three gentlemen would never have been able to overcome the difficulties of the Caucasus if they had not previously been trained to climbing mountain-peaks among the Alps. When he first read the paper, which he did with great admiration, tracing step by step the enormous difficulties that these gentlemen had undergone, he was surprised at some very remarkable features which were brought forward; namely, the great superiority of the Caucasian chain over the mountain ranges of Europe in scenery, in the foliage, and in much that engages the attention of the botanist and the geologist. One remarkable fact was this, that, in this very remarkable region, deciduous-leaved forest-trees were found up to the snow-line. At altitudes where in the Alps were found only conifers, in the Caucasus ash and birch are growing in abundance. Reverting to the geographical position of Elbruz and Kasbek, he had the satisfaction of exhibiting to the meeting the geological map of Russia and the surrounding States (he here held up the map) as prepared by his colleagues, M. de Verneuil and Count Keyserling and himself in the year 1845, for on this map the two mountains of Kasbek and Elbruz are laid down as formed of igneous rocks on the northern side of the Caucasian chain, precisely in accordance with the observations of the three brave young Englishmen. Of their exploits he was most proud; and he must add that the Alpine Club had done good service in training up men who could accomplish such a very remarkable exploration.

Sir HENRY RAWLINSON, on being called upon by the President, said he had seen these mountains only from a distance when in Russian Georgia, but had conversed a good deal about them with Russian officers, and the impression he derived was in accordance with what Mr. Freshfield had said. The mountains, he believed, had never really been ascended by the two German savans. He thought the analysis of the ascents which had been given by Mr. Freshfield was quite sufficient to convince us that these English gentlemen were really the first people who had ascended the mountains. He quite agreed with Sir Roderick Murchison as to the advantage of training our young men in mountain research and discovery. The Alpine Club really deserved well, not only of geographers, but also of the country. We heard much of the risk to life, of the danger and drawbacks which attended the pursuit; but really these were the very things which formed and tempered the English character. Unless we had these schools of danger, we should not be the nation we are. When he came back from Georgia, seven or eight years ago, he took the opportunity of mentioning to the Society that the southern slopes of the Caucasus formed the most beautiful tract of country he had ever seen. In the autumn there was no country in the world that could be compared for sylvan beauty with this region. He also mentioned, at the time, that the beauty of the inhabitants was fully equal to the beauty of the scenery; and, on that account, he would also recommend the country to the admiration of his travelling countrymen. Again, in the matter of ethnology and archaeology, this country was exceedingly interesting. These very Ossetes, "the gentlemen of the Caucasus," were one of the most interesting races in the world; the Ossete language was nearest to the Sanscrit of any language spoken west of the Indus. Throughout the Caucasus there were traces of all the languages we know anything of; there were fifty or sixty different languages all collected in a small area, remnants—"linguistic boulders" we might call them—of languages that had died out. He believed, when the subject was more fully investigated, that the Caucasus would be found to be a perfect mine of philological treasures. Again, the very names that had been quoted were of the greatest interest. Thus *Takenis Tegnali* meant really "a horse river;" it represented the exact name of *Hippopotamus*, which the Greeks gave to the river. Then *Elbruz* was a pure old Hun word, meaning a very lofty

mountain; and its existing in an isolated spot like that was of antiquarian interest.

The PRESIDENT said he had only one other observation to make with respect to the paper. When he read it, he wrote to Mr. Freshfield to say how much he regretted that he had not brought home a small piece of the summit of this remarkable mountain, Elbruz—it would have been worth many times its weight in gold. It turned out, however, that Mr. Freshfield had brought home a little bit, which he now held in his hand. It would be deposited in the Museum in Jermyn Street, with a suitable inscription. In reply to an inquiry, the President said it was an igneous rock of ancient volcanic character, which he believed had not formed part of a subærial eruption.

Mr. SAUNDERS said, the question was, whether that piece of rock came from Asia or Europe? His inclination was to the side of the ancient geographers, who classed the Caucasus with the mountains of Asia. The direction and the whole character of the range went to show that it belonged to Asia rather than to Europe. The inhabitants were more Asiatic than European; and the Russians, in their administrative arrangements, wholly ignored any division which would separate the Russian provinces on one side of the mountains from those on the other.

The PRESIDENT said they could not then go into the general discussion of that which, according to territorial divisions between States, might be considered to constitute the boundary between Europe and Asia. In the Ural Mountains, which, in the eastern dominions of Russia separate Europe from Siberia and Asia, the real dividing line is the watershed; and he (the President) as well as the present Emperor Alexander II. (when Csesarewitch) have, when sitting across the culminating central peak of that chain, had one leg in Europe and the other in Asia.* On this same principle of physical geography, the President considered Elbruz and Kasbek to be in Europe, because they both stood out on the northern side of the Caucasian watershed.

Fifth Meeting, January 25th, 1869.

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT, in the Chair.

PRESENTATIONS.—*Felix Bedingfeld, Esq.; Captain B. V. Layard.*

ELECTIONS.—*Henry Blaine, Esq.; Walter L. Buller, Esq.; H. E. Buxton, Esq., B.A.; Colonel Elsay, R.E.; Lieut. G. F. Harris; John Howard, Esq., C.E.; John K. Laughton, Esq.; Captain W. R. Llewellyn, B.A.; R. J. Moser, Esq.; Peter Rylands, Esq., M.P.; Thomas Sutherland, Esq.; John B. Sedgwick, Esq.; Captain C. E. Stewart, I.A.; Col. E. Smyth; Warrington Smyth, Esq., F.R.S.; Captain Frederic Trench; Lieut. Henry Trotter, R.E.*

ACCESSIONS TO THE LIBRARY FROM JANUARY 11TH TO JANUARY 25TH, 1869:—‘*Handbook of the Economic Products of the Punjab.*’ By Baden H. Powell. Roorkee, 1868. Presented by the author.

* See ‘Russia and the Ural Mountains,’ Frontispiece and p. 424.

'Expedicion al Interior de la Republica del Peru.' Por Juan G. Nyström. Donor, the author. 'Reise durch Nord Afrika, von Tripoli nach Kuka.' By Gerhard Rohlfs. Donor, Dr. A. Petermann. Memoir of the Hydrographical Department of the Admiralty, 1868. Donor, Captain G. H. Richards, R.N., Hydrographer. 'La Terre.' Par Elisée Reclus. 2 vols. 1869. Purchased. 'Ueber Compass und Compass-Karten.' Von Dr. Sophus Ruge. Dresden, 1869. Donor, the author. 'On Greenland Alga.' By Professor Dickie. 1869. Donor, R. Brown, Esq. 'Pinnipedia frequenting the Spitzbergen and Greenland Seas.' By R. Brown. 1869. Donor, the author.

ACCESSION TO THE MAP-ROOM SINCE THE LAST MEETING OF JANUARY 11TH, 1869.—Map of Vancouver Island and British Columbia. By R. Brown, Esq., F.R.G.S. Presented by A. Petermann.

The following papers were read:—

- 1.—*On the Effects of Forest Destruction in Coorg.* By GEORGE BIDIE, Esq., M.D.

[EXTRACTS.]

Coorg lies near the centre of the Western Ghâts, and chiefly on the eastern aspect of the range. On its western margin the crests of the chain rise up in bold peaked mountain masses, some of which attain the height of 5000 feet above the sea, and to the east of these the country consists of a series of low, long-backed hills, with intersecting deep-set valleys, running out towards, and gradually subsiding in, the table-land of Mysore. The province is chiefly drained by the Cauvery and its tributaries, but several large streams descending to the western coast of the Peninsula also have their origin in it. The Cauvery rises far to the west, and for the first 10 miles or so of its course passes down the centre of a broad, flat-bottomed valley, surrounded on three of its sides by steep lofty hills. Contrary to what might have been expected, this large basin contains but little forest, so that the heavy rainfall that descends on it must at once be precipitated into the river. The average elevation of Coorg is about 3000 feet above the sea, and at no distant date nearly the whole province appears to have been covered with forest. Towards the west, the remaining forest is, as a rule, dense and lofty; but at the distance of 10 miles from the crest of the ghâts it begins to get less so, and at 12 miles we enter the bamboo district, in which the trees are smaller and the jungle more open. The nature of the forest, and also the kinds of trees found in it form pretty accurate indexes of the amount of rainfall. Thus in the

dense jungle-tract, the annual fall varies from 120 to 150 inches, while in the bamboo district it ranges from 60 to 100 inches.

The rain in Coorg may be said to be derived entirely from the south-west monsoon—the showers at other seasons being few and light—and is chiefly deposited between the 1st of June and the end of September. During that period the heated plains of Central Asia cause a steady indraught of the south-east trade winds, rendered westerly by the diurnal rotation of the earth, and as these pass over an immense expanse of ocean ere they reach the land, they become heavily charged with moisture in their course. Shortly after quitting the sea, they encounter the western ghâts, standing right across their track, and drop upon them and the low country to the west of them, the greater portion of their watery freight. The chief cause of the precipitation is the reduction of temperature produced by the warm moist air coming in contact with the colder hills, and by the decrease in density that ensues as the current rolls up the mountain side. It will thus be seen that the rainfall in Coorg depends entirely on its geographical position and geological conformation. In other words, it is so located that it is traversed by the south-west monsoon at the time when that wind is most densely charged with moisture, and so elevated as to obstruct its current and cause copious precipitation. Under such circumstances, it can be of little consequence, as regards the rainfall, whether the mountain slopes are bare or clothed with dense forests, as neither condition could have any appreciable influence on the amount of precipitation, or on the course or duration of the monsoon. I look, therefore, on the forests that grow on these highlands as a consequence, and not the cause, of the rain; and this view is supported by the change that takes place in the nature of the forest as we proceed eastward from the crests of the ghâts and the rainfall diminishes—the gradual diminution being easily accounted for on purely physical grounds. It does not appear, therefore, that the annual rainfall in Coorg has or can be sensibly diminished by the destruction of forests which has taken place.* At the same time it must be stated that the natives of the district complain that of late years their country has become hotter and drier from want of rain, and that rice crops have been diminished or lost from a failure of water in streams that used to run throughout the year. These changes they attribute to the cutting down of forests on coffee estates; and it will, therefore, be necessary, to inquire, what

* It would have been well if this view could have been supported by records of the actual rainfall during the last 15 or 20 years, but, unfortunately, prior to the beginning of 1863, no reliable observations appear to have been made. At present there are gauges at three stations, watched by careful observers.

effects the destruction of forests actually may have had on the climate and streams of the country. In so far as regards the rainfall, the subject has been already discussed, so that it only remains to notice its bearing on other elements of climate and on the drainage.

It is only since the advent of the European planter, or during the last twelve years, that felling of forests to any considerable extent has taken place in Coorg, and as the clearing has progressed in annual instalments of comparatively small extent, the results have crept on gradually, so as to render them much less obvious than if the entire extent had been cleared in a single season. There can be no doubt, too, that the evil influences called forth by forest destruction do not attain their full force immediately, but go on increasing from year to year until they acquire a most disastrous power. The total area of land denuded of forest in Coorg to make way for coffee amounts to about 20,000 acres,* and the clearings have been mostly made in the dense jungle tract, although a good many estates have of late years been opened out in the bamboo district. The spots that have been selected as sites for estates are chiefly situated on the flanks and crests of low hills, the sides and bottoms of ravines, and the slopes of passes running down on the western side of the ghâts of the low country. Such localities, as a rule, are densely wooded, and, being well supplied with springs, give rise to numerous small streams. In fact, they may be looked upon as the fountains of the river-system of the country. The question then arises—to what extent are springs and streams in such situations dependent on the forest for their supply of water, and what will be the effect on them of its removal? It is, perhaps, hardly necessary to say that springs and small streams are fed by the water stored up in the earth during the rainy season. As the rain descends on natural forest, it is conveyed in various directions by the leaves towards the ground, and on reaching this prevented from running rapidly off by the dense undergrowth of shrubs and herbaceous plants, and a carpet of dead leaves. Below this it encounters a layer of vegetable mould, which, having a great affinity for moisture, absorbs it like a sponge. As soon as the humus is fully saturated, it passes on what water may subsequently fall to the subjacent mineral earth, and this process of percolation is in various ways aided by roots, which descend to great depths, perforating the densest subsoil, and even forming passages in rock. The quantity of water thus transferred to the depths of the earth and the reservoir of springs is enormous; and when the dry season

* This represents the total acreage according to returns from individual planters.

arrives, the forest again plays an important part by husbanding and giving off gradually the subterranean supplies. The means by which these beneficial influences are exerted are various and interesting. As the water rises to the surface, it is, as in the case of its descent, again partially retarded by the layer of humus, and having passed through that, so obstructed by various mechanical obstacles, that it does not readily acquire the volume of a stream, and so pass quickly away. The way in which the soil is matted together by roots in forests also renders it very difficult for a small stream to cut out a channel, and when such has been formed, it is in general so tortuous, and the current so slow, that it must lose a considerable amount of water by percolation. At the same time, the shade of forest greatly restrains evaporation, and although the quantity of water taken up and exhaled by trees is very great, a portion of it is returned as dew or fog, and what is wafted away is fully compensated for by other advantages resulting from the presence of forest. The influence of shade in modifying evaporation is well illustrated by what happens in the coffee districts after the April showers which herald the advent of the south-west monsoon. On an estate freely exposed, a day or two of sunshine after a heavy fall will have rendered the soil quite dry and hard again, whereas on an estate under forest shade the ground will continue damp for a week or more. Although their insignificance might lead to their being overlooked, there can be no doubt that the mosses, lichens, and succulent herbaceous plants, which abound in tropical forests, are also of considerable benefit in retaining moisture, as, during rain, they absorb water like a sponge, and part with it again very slowly. It would, therefore, appear that there are numerous agents and conditions in natural forests favourable to the production and permanence of springs and streams, which are not to be found in open ground originally so, or denuded of its trees by man. During the whole of my tour in Coorg and Mysore, I have endeavoured to collect information bearing on this important question; and the facts thus elicited on the whole go to prove that tropical forest is the *alma mater* of springs and streams. Various instances have been brought to my notice of springs and small streams having become quite dry since the forest was cleared away in their neighbourhood, while in numerous cases those that used to be perennial only contain water now during and for a short period after the monsoon. Similar results have been found to follow the destruction of forests growing near the sources of streams in all parts of the world.

When land is being cleared for coffee culture, the woods and

their undergrowth are cut down and burned, and, during the conflagration, not only is the ground deprived of its carpet of vegetation, but a portion of the humus consumed, and the remainder so dried that it is liable to be washed away. When rain falls on such ground, instead of being delayed and gradually conveyed into the soil, it at once rushes down the bare slopes, enters the nearest nullah, and is rapidly carried out of the district. At the same time, a certain portion of the surface soil is carried away, the conservative agencies of the forest being no longer in existence. The effects of this degrading process continued through a number of years may be well seen on the crests and slopes of some of the lower hills in Coorg, in what is called grass or *banay* land. In such situations nothing is left but the barren stony subsoil covered by a coarse grass, or bearing a few stunted shrubs of some hardy description. The most striking results of clearing, however, are the channels cut out in new situations by the storm-water as it seeks a lower level, and the landslips caused by percolation behind banks of earth, which have no longer the binding influence of tree-roots to keep them in position. The *nullahs*, too, or natural watercourses, which used to be sufficient to carry off the surplus water, are no longer so, and an impetuous torrent dashes down them, eroding their banks and carrying along with it not only earth, but stones often of considerable size. These results were very forcibly pointed out by Major Sankey in his Report on the Public Works in Coorg for the official year 1865-6, in which he shows that great damage has of late years been done to roads and bridges in the province by the floods resulting from forest clearance. This Report drew the attention of the Right Hon. the Secretary of State for India to the subject, and in July 1866 he forwarded a despatch to the Government of India, which induced them to suggest to the Madras Government the necessity for a further inquiry into the effects of these freshets, and thereupon they requested the opinion of Dr. Cleghorn, the Conservator of Forests, on the subject. Accordingly, in August 1867, when the monsoon was in full force, he proceeded to examine the Cauvery, which, as already stated, drains the greater portion of Coorg. The point of observation was the junction of the Cauvery and Bhowani rivers, but no trace of unusual flood could be detected there, and Dr. Cleghorn also states in his Report on the subject, that the Water Returns for 20 years from the Tanjore District, which is irrigated by the Cauvery, do not show any material alteration in volume. Dr. Cleghorn's most interesting Report was published in 'Proceedings of Madras Government, Revenue Department,' dated 23rd September, 1867, and, since the commencement of this inquiry, it has been

repeatedly brought to my notice as being opposed to Major Sankey's views, and the theory in general of floods in rivers being a result of destruction of forest. A brief explanation, however, will, I think, show that Dr. Cleghorn's observations do not in the slightest degree affect the question at issue. Before the Cauvery reaches the place where it was watched by him, it receives numerous tributaries from other districts, which swell it to such a size as would render any increase of water from Coorg hardly appreciable, and it is also between Coorg and Coimbatore frequently tapped by irrigation canals, which have a considerable modifying influence on the volume of rivers. It is also worthy of notice that the forest immediately on the banks of the Cauvery, while it runs in Coorg, remains almost intact, and that the drainage of a large extent of the cleared land does not flow into it, but is carried off by streams running to the western coast of the peninsula. The effects, therefore, of forest destruction in Coorg as regards floods, would be chiefly local, and most apparent in the very spots where they were noticed by Major Sankey, viz., along the course of tributaries of the Cauvery and of other streams arising in, or passing through, denuded tracts of land. At the same time, there can be no doubt that, if the clearing is greatly extended, its effects will ultimately become apparent in rivers far beyond the limits of the province.

It now remains to offer some remarks regarding the amount and locality of tracts of forest that should be preserved to save the climate from further deterioration, regulate the drainage, and maintain the famed fertility of Coorg. Running a line from Mercara in the north by Moornaad, and due south until it touches the crest of the ghâta, we have to the west of this a large and well-defined basin, in which the Cauvery and some of its tributaries arise. Only a very few clearings have been made in this tract, and the land, as a rule, is in the hands of the Coorgs, who seem anxious that the standing forest, of which there is a great deal, should be left untouched, and the district kept sacred to them and their descendants. One can sympathise with them in these wishes; and for other substantial reasons, I would strongly recommend that forest destruction should be strictly prohibited in this quarter. Again, from the ford on the Cauvery at Moornaad down to Fraserpet, it seems desirable that a belt of jungle, at least 50 yards wide, should be kept intact on each bank of the river. Forest on the crests or slopes of hills in which important streams arise should also be carefully preserved, and the banks of streams should always, to the distance of 20 or 30 yards on each side, be left under wood, as its presence serves to keep up the water-supply in the dry season

and to prevent floods in the rains. Although of less importance, too, there seems no doubt that trees on the banks of streams to a certain extent encourage the increase of fish. As a rule, forests growing on the eastern or western slopes of the immediate crests of the ghâts should also be preserved, as precipitation is greatest in such situations and denudation sure to cause floods, and induce in a marked degree other bad effects. The slopes of hills having a south-west exposure should also be kept under forest, as they are comparatively worthless for the culture of coffee or any other plant, the south-west monsoon destroying everything directly exposed to its force. Any one who has not been on the ghâts during the monsoon can hardly form an idea of its violence: not only is coffee injured or killed by the wind, but in exposed situations young plants newly put down have been swept away by the torrents of water running down the bare hill-sides. The importance of belts of jungle being maintained along the sides of public roads, so as to prevent landslips, &c., having already been recognised by Government, does not require any further notice here. Before giving off land in future for clearing, it would be well to submit it to a careful inspection, so as to ascertain whether any portions of it would be unfit for the growth of the plant which it is proposed to cultivate, and the forests on unsuitable parts should then be kept standing. One would think that self-interest would prevent landowners from trying to cultivate such spots, but many proofs to the contrary might be brought forward. At the same time, it could be seen whether the proposed clearing would be likely to produce floods that might prove dangerous to public works, and action taken accordingly. The rice-lands in Coorg are very peculiar, being long, narrow, winding patches, surrounded by low forest-clad hills, from which they derive their water-supply. It would manifestly, therefore, be imprudent to cut down any forest in their neighbourhood. Forest in the upper end of ravines should also be preserved, as it invariably gives birth to springs and streams.

The Paper will be published entire, in the 'Journal,' vol. xxxix.

The PRESIDENT, in expressing the thanks of the Society to Dr. Bidie, said it was highly gratifying to Geographers to see the various branches of Natural History combined, as they were in this Paper, in illustration of a great subject in physical geography. The subject also suggested matter for reflection on the part of the English nation, owing to the vast quantity of water which is lost annually, by not having proper means of accumulation, so that in time of drought our rural population have difficulty in obtaining supplies of water. A vast proportion of water ran off to the sea by the rivers, and a great part was drained off by the improved agricultural drainage. This subject had been discussed on a previous occasion, when Mr. Markham read a Paper on Southern India. In Russia he could testify himself that the practice of cutting

down great forests was, to a great extent, ruining a large portion of the country; the water was not husbanded in the manner which had been described by the author of the Paper. The water ran off rapidly by the Volga and other great rivers, which were much lowered in summer, to the great detriment of the agriculture and commerce of the country. He hoped Dr. Cleghorn, the Conservator of Forests in India, who was present, and to whom we were more indebted than to any other gentleman in reference to this important question, would make some observations upon the Paper.

Dr. CLEGHORN said that during the last twenty years he had four or five times traversed the region alluded to in the Paper. Any one acquainted with Dr. Bidie, the Secretary of the Agri-Horticultural Society of Madras, would feel sure that he would give a careful and well-digested report upon the subject. The facts in the report dwelt mainly upon two considerations, which he thought should be discussed separately—the question of rainfall and the question of drainage. With regard to the progress of deforesting, it appeared that at the present moment about sixty Europeans went out annually as coffee-planters to the Western Ghats. The average acreage was perhaps 150 acres of forest, and the average amount of capital introduced by each planter was about 1500*l*. Therefore, there was a large amount of capital invested in that chain of Ghats. According to Dr. Bidie's report, and according to the admission of the planters themselves, 20,000 acres had been cleared in Coorg. He did not himself believe that the clearing of 20,000 acres would affect the precipitation of moisture in that vast chain of Ghats, considering its peculiar position with regard to the sea. He quite agreed with Dr. Bidie upon that point. The question of drainage was an entirely different one, and very serious consequences were stated to have ensued. These were first brought to the notice of Government in 1866, by two distinguished engineers—Colonel Lawford and Major Sankey. Major Sankey sent in a report with some remarkable artistical illustrations, showing that the water was finding a lower level; that some of the ancient Ghats had suffered very much from the drainage; that the old channels were found insufficient; that the embankments were undermined and had given way on the outer side towards the sea in various places; and that considerable damage had followed. Colonel Lawford, on the other hand, said that Coorg was becoming a great garden, at the expense of the rice provinces below, which were likely to suffer very much. The Madras Government, in 1867, directed him (Dr. Cleghorn) to proceed up the Cauvery and to examine the effect upon the river-bed. About midway, where the Bhowany joins the Cauvery, he examined the rocks on both sides where it was narrow, and he did not find any marked alteration. He insisted very strongly as to the importance of keeping up the meteorological register at Mercara, on the one hand, and on the other of keeping up the water-measurement at Tanjore. At the beginning of the south-west monsoon, more water flowed off than formerly, and the flow failed a little sooner; there was a tendency in that direction, but it was not then so marked as to warrant any interference with the clearings to any great extent. Certain remedies were proposed, such as the preservation of all wooded crests, 800 feet from the top, on the south-west slopes where the burst of the monsoon was most violent; also the preservation of 50 yards of wood on each side of the trunk-roads and the rivers. He concurred with what Mr. Marikham stated in his paper, that on the eastern slopes it was of the greatest consequence to preserve the forests, because the mass of the population is on that side. The native population were almost universally of opinion that the climate was drier on account of these changes which man was gradually introducing. There were some interesting facts stated in Dr. Bidie's report, such as the increase of insects and insectivorous birds, the increase of certain plants, and other remarkable facts which were well worthy of attention. What was required was that the Forest officers and the Canal officers should

cordially co-operate and watch the changes from month to month. The Forest Department was a new one, initiated only 12 to 13 years ago; it was gradually increasing in usefulness, and it was receiving that great attention which it deserved. There could not well be a more momentous subject for the consideration of that Department than the one then under discussion.

Mr. GEORGE CAMPBELL could not pretend to give any opinion upon the purely scientific question as to how far the actual rainfall was affected by the clearing of forests. He entirely concurred in the view that the clearance of land had the effect of making the soil drier, of inducing a more rapid drainage by causing the flow of water in the rivers to be more sudden and rapid, the floods to be greater, and the droughts to be more severely felt. But he did not go as far as Dr. Bidie in considering that the destruction of forests was in every respect prejudicial. Dr. Bidie seemed to consider it injurious to human life. In India the contrary was the fact. Where forests were cleared away and drained the country became more healthy. He could not think that Coorg could be an exception to the rule. But then came this question,—that, as the effect of clearances was to render the soil drier and the streams more rapid, what could be done? He would not prevent coffee-planting for the sake of more moisture. The major consideration must prevail over the minor. Although we might apprehend certain bad effects indirectly, still we could not put a stop to the progress of British enterprise and the progress of cultivation. The true remedy was that which had been suggested by the President, namely, better modes of storing water for use in the dry season. The great minds of India and Europe had been turned to the subject. It had been his duty to examine some of the greatest schemes which the world had ever seen, with the view to that object,—those which Sir Arthur Cotton had suggested with respect to the waters of the Godavery. It was proposed to run enormous dams across great valleys, and thus store the flood-waters, and, at the same time, do what was done on a smaller scale in France,—protect the country below from inundation. At present these schemes had scarcely reached beyond the point of theory. The Government of India were most anxious to do all they could to promote them. When he was chief Commissioner in the Central provinces, the Government sent him engineers from Madras skilled in these matters, and he had directed them to survey the upper branches of the Godavery in the hope that one day Sir Arthur Cotton's scheme would be carried out. With respect to the preservation of forests the Government were not behind, and of late years they had been most zealously active. The whole country was covered with forest officers, who were doing all they could towards the preservation of forests in India, short of stopping cultivation.

Mr. CLEMENTS R. MARKHAM entirely concurred with Dr. Cleghorn and Mr. Campbell. It appeared to him when he was in India that, looking to the large number of people going out there, and the quantity of capital that was being invested, it would be hopeless to attempt to prevent the destruction of forests on a large scale. But what the Government might do was to prevent the forest being destroyed in places where the land cleared would be useless for cultivation. He remembered seeing in more than one place—in one place on a very large scale—on the north face of the great hills near Coorg, an enormous area cleared of forest, which, after it had been cleared at considerable cost, was found to be absolutely useless for coffee cultivation, owing to the rocky nature of the soil. Now that forest might have been preserved by the Government. It ought not to have been sold. The peaks of the hills could always be preserved. He did not doubt that the slopes of the hills would be eventually covered with cinchona and coffee plantations, and that the climate would ultimately deteriorate in those districts. But he did not see why there should be any danger to the plains from floods, because though the forests might be destroyed, still in certain positions on the hills

enormous reservoirs might be formed, which would have the same effect as the forests in preventing the sudden rush of surface drainage, which was the great danger to be apprehended to the lower country where rice was cultivated.

2. *Description of the Island of Rapa.* By Captain VINE HALL.

I MAY commence my notes by saying that the island has been hitherto erroneously called Opara; but on my recent visit to it I enquired particularly as to its proper native name, which I found was pronounced nearly as if spelt with an L, and two ps, or Lappa. Opara, they said, "was English name." In future it will be called Rapa.

This Island—like other places one might mention—has acquired a temporary and adventitious value, principally from its position, and the possession of a harbour. It was first discovered by the English navigator Vancouver, since which time it has apparently been very little visited except by the small trading-vessels from the neighbouring islands. Vancouver described it truly, as rugged, formed of craggy mountains, with very little level ground—the narrow valleys between the precipitous hill-sides affording the only space for a limited cultivation.

The position of Rapa is in $27\frac{1}{2}^{\circ}$ s. latitude, and 144° w. longitude; about 700 miles s.e. of the Society group, and as nearly as possible two-thirds of the distance between Panama and Wellington.

Very little was generally known about the island till lately, and nothing of its being favoured with so perfect a harbour. The finding of it out was the result of very many enquiries I made from every one I could hear of who had been to the South Sea Islands, as to the existence of some suitable spot, where we might have a coal depôt. For, on the establishment of the Panama service, I was so impressed with the desirability, if not necessity, of some stopping-place near the route, that I used every effort for months, endeavouring to find one. At last I was rewarded for my pains by hearing of Rapa.

Its situation, just on the outer verge of the Southern Archipelago and in the direct track (not the direct line) between Panama and New Zealand makes it particularly advantageous as a place of call in case of accident or deficiency of fuel.

And, speaking of the track of the steamers between New Zealand and Panama, I will for an instant advert to the difference of route in going towards Panama and returning from it.

Leaving Wellington, we adopt what is called the "great circle" course, which, though apparently roundabout, is in reality the

direct and shortest line to Panama. Now, in returning from Panama to Wellington, we appear to adopt a much straighter course, but it is really somewhat longer. This is readily explained by reminding you that we are not sailing upon a level, but a curved surface. Take a round body to represent the earth, a thread stretched between any two points, is evidently the shortest distance between them, and viewed in a line with the centre is straight. This should be the ship's course. But on the chart generally used, this straight line will appear a curve—and all the straight lines (meridians excepted) are really curves. And although Mercator's projection, as it is called, is the most simple for the ordinary purposes of navigation, yet it has led many people, and even seamen, to have confused ideas upon this very simple subject. In the track upwards to Panama the winds are frequently found favourable, because the course lies principally in the well-known belt of westerly winds. From Panama we keep further north, through the heart of the easterly or trade winds prevailing generally, though varying with the seasons, between the equator and the southern tropic. In this part of the voyage the winds are less favourable than the other, and particularly in the latter part, trying to avoid the westerly or adverse winds which prevail further south, we adopt this track which brings us close to Rapa.

The island is of very irregular form, with several indentations in the coast; two of which are considerable bays, having each its little village, whilst the third and largest is the harbour. It is about twenty miles round, though from the irregularity of its outline it is difficult to estimate this exactly. The coast is bold, with no out-lying reefs beyond half a mile.

The French have assumed the protectorate of it—on the ground, I believe, that it is a dependency of the Tahitian group; but looking a day or two ago at a recent French map of the world dedicated to the Emperor, I saw a circle described round the Society group, as the limits of their protectorate. Now this line happens to be more than 200 miles distant from Rapa; and had we not established a station there, I fancy they would never have gone near it. But the French having made an effort to induce the Company to adopt Tahiti as the half-way house, of course unsuccessfully, and hearing that we were in search of a place more in the track than Tahiti, they fancied it must be at one of the Gambier Islands, lying considerably to the *s.e.* of Rapa, and included in the protectorate circle. Accordingly they sent a Resident there to watch our proceedings. Finding after some time that we did not appear there, but had selected Rapa for our port of call, the same Resident was

sent to that island in the early part of the present year, on board the French war transport *La Dorade*. A few months previous to this, and subsequent to our appearance at the island, another French steamer, *La Touche Treville*, called at the island. They make out for the first time that Rapa—though nearly, as I said, 300 miles out of the magic circle drawn by themselves round the Society group—belongs to the Tahitian protectorate. Some three months ago the French war steamer *La Touche Treville* called at the island, as I am informed, made nearly all the inhabitants drunk, and got the King Tapanna (a most powerful toper) and two chiefs, Miroto (the man who betrayed the Tahitians to the French) and Eiton, to sign away the island to the French. This Eiton told me himself. Many of the influential chiefs being absent, kept sober on the occasion, and deny the King's right to alienate any lands not his personal property. His dusky majesty having drunk all the rum, now begins to repent his bargain, and hopes the English will come to the island and preserve him from all intruders. The object of the French was, as one of their captains told us, simply to embarrass the operations of the Company, or they certainly would not incur an expense of about 600*l.* per annum to watch our coaling merely.

It is only due to the supineness of the English Government that this fine harbour is not under their control; for three years ago, on my representation, application was made to the Admiralty to send a man-of-war there. However, nothing was ever done in the matter.

The appearance of Rapa as we approached in the *Buchine*, was very picturesque, with its sharp peaks thrust up as it were into the air, through the irregular but more rounded forms of the mountainous hills of the island. The harbour lay just before us, with two coal-ships securely moored about two miles off, there being seemingly no obstruction between us and them. But beneath the quiet-looking surface lay the treacherous reefs, which, difficult and dangerous as they are to approach heedlessly, form the security of the harbour. We stopped some time, close to the entrance, waiting for a boat to come off, the Captain prudently hesitating to enter, lest the buoys might by accident have become displaced. And the event proved how wise this precaution was, for we found afterwards that one of the principal buoys had been driven by a recent gale quite across the Channel. At length the expected boat came, with the Captain of the Company's coal-ship, and a native pilot. We moved cautiously ahead, and very soon the bottom was clearly visible under us; then we approached the entrance of the narrow tortuous channel among the reefs, the rocks glistening just below

the surface, ominously close to the ship at times. The Captain and our two pilots were all on the *qui vive*, as we threaded the crooked passage, appearing as a blue line amid the black and green patches of the reefs. It was with a feeling of relief we at length saw that we were safely through the lines of buoys, and found ourselves in the most romantic, snug harbour imaginable; the land rising on three sides, like the walls of an amphitheatre, and protected by the reefs and a beacon islet on the fourth, or eastern side; with the advantage of having fresh air from the open sea. Twenty ships might moor safely there, and small craft innumerable. The endless variety of form and colour around us was most enchanting. Near our anchorage was a very small village, rejoicing in thirty-one inhabitants; but further off, on the opposite side, was another large village, which we call the capital—where the King and the French Resident live. We only regretted to see the French flag waving there instead of the English; and there is not the slightest doubt but that the natives would themselves have preferred it. It is, perhaps, matter of legitimate regret that the simple manners and customs—the primitive feudal sway of the native chiefs—should be interfered with by either flag.

Our coaling, of course, was proceeded with at once, and the greater part of the passengers, anxious to escape for a while from their iron prison, gradually dispersed on shore; whilst those who remained made bargains with the natives for coral, tropical birds' feathers, bananas, &c. I began doing a little sketching, and, after securing some of the very peculiar features of the land, my next object was to determine, with a moderate degree of accuracy, the height of the most prominent of the remarkable *aiguilles* which jut up in this curious island. This had never been done, and, previous to arrival, I had received so many different guesses at the height of the Rapa peaks, varying from 400 to 1400 feet, &c., that I was the more anxious to arrive at something definite. The difficulty was to secure a sufficiently level space to measure a base-line (not the most easy thing to do with precision, even under favourable circumstances). However, finding the shore was impracticable, I selected a spot on the beach, nearly in a line with the ship and the mountain. Then I ascertained the length of this in three ways. One by measurement from the chart, another by sound, and thirdly, by the angle subtended by the ship's whole length with sextant. The average of these gave me a tolerable base, and of course by the angles at each end of the same, and a little triangulation, I arrived at the height of the peak I selected,—viz., 2100 feet. My short experience of the inhabitants, together with the testimony of others, gave me a very

favourable impression of their peaceful simplicity of character and honesty. They number now only about 125 to 130 men, women, and children. Formerly it was thought, and, indeed, according to their own account, there were 1200 to 1500 in number. But it is said that internal wars in the first instance, and then the ravages of various epidemics brought amongst them, have reduced the inhabitants to the present limited number. They are in appearance a fine, manly, well-made race, and looked very Maori to me. The wonder is that, living as they do principally upon an esculent root called "taro," somewhat tasteless and insipid to us, with a scanty supply of meat and fish, they keep up so good an appearance.

The language generally, the names of the points of land, mountains, &c., seemed to my ear also very Maori like. However, I cannot speak very positively on this head, as my Maori lore is not great. Almost the only word of Maori which I know (and that they tell me is wrong) is—*Tenako*. Of course I tried the effect of this, but I was responded to by—*Uronnah!* sounding very much like "Your-honour," which I thought properly respectfully and somewhat Irish.

The climate of the island must be to a European very delightful; for, surrounded as it is by the sea, the temperature is very equable, and though close to the Tropics the thermometer seldom shows more than 75° in the height of summer. The weather, though mostly fine, is changeable, with occasional sudden showers, as might be expected from the effect of the high peaks arresting the clouds and causing them to precipitate their suspended moisture. The winds are for nearly nine months of the year from south-east to north-east, and westerly the remaining part. For, of course, lying so near the Tropic the trade-wind is swayed southward by the sun in the summer time (November, December, January, and February), when the island is embraced by it, and left in the winter to the northern limit of the regular westerly current of air which then extends more northerly. I have arranged with the Meteorological Department in England to make it a station for these observations, and very shortly the instruments will be there; so that Rapa may become a point of great scientific interest and utility. In fact, the Southern Pacific being an almost unknown sea to us, meteorologically, the importance of this fixed station at Rapa, in conjunction with the observations on board the Panama ships, and in New Zealand, cannot be too highly estimated.

We have already a tide-gauge there, showing the extreme rise and fall to be 2 feet 6 inches, and the establishment of the port, or high water at full and change, 12.15. The wave which in August

swept along these coasts was also felt at Rapa, indeed it partly washed away our coal-wharf. There was also a slight earthquake, the impulse of which came from the south, coinciding very nearly in point of time with the disturbances felt here and those which have desolated Peru; all which effects confirm very significantly the sagacious predictions of our friend Dr. Hector, of the locality of the principal eruption. Further particulars and more exact information relative to the time of those occurrences will invest these phenomena with yet greater interest.

The peculiar irregular form of the land with precipitous mountains and deep gullies cause sudden gusts and eddies of wind in the harbour, varying continually in direction, so that it is difficult to say exactly what wind is blowing outside, unless it happen to be from the eastward or directly in. There is a remarkable absence of surf, I am informed, which is not easily accounted for; my correspondent saying "that landing is easy anywhere, and boats can lie alongside precipitous cliffs exposed to a swell which rolls in unchecked for thousands of miles without breaking." I am quoting from a letter to me from our representative.

The resources and products of the island are at present but few in number or quantity, excepting perhaps goats, which abound, and are to be seen everywhere delighting in the most inaccessible places, where, with a glass, their forms moving to and fro on some razor-edged mountain stand out in relief against the sky. Small vessels occasionally take a cargo of them away to Tahiti. I was told that the Governor of that island had ordered the French Resident at Rapa to have them all destroyed. Upon what enlightened principle, it is difficult to say; but the Resident had too much good sense to comply with the order. The *Ruabine* had the previous voyage landed on trial some sheep, but they did not seem to thrive. A few pigs are procurable—good, but dear. There are a few fowls wild in the bush, some widgeon, and of course sea-gulls. There are no reptiles, although one of our passengers told me he had been in bodily fear of them all day; and his enjoyment had thus been very unnecessarily marred. Rats are very numerous. It is curious that when our coal-ship first went there they were troubled with mosquitoes, though none were found on shore. They were in fact taken there in the ship, and have now disappeared. There is an abundance of fish; some very beautiful, especially the parrot and gold and silver fish; good mullet, and some other kinds are readily procurable; of sharks, plenty.

The taro-root, the chief support of the inhabitants, grows abundantly, but requires attention to its culture, as it will not grow

without plenty of water. We left a quantity of English vegetable-seeds, and we hope they will do well. Water-melons are plentiful and cheap; bananas grow well, and are very good; oranges are produced, but of very poor quality; pine-apples, also very inferior. The sugar-cane likewise grows well, and there were cocoa-nuts formerly on the island, but a blight destroyed them all some years ago. I could not ascertain if they thrive well; but, I believe, the cocoa-nut tree is a great discerner of latitude, and will not flourish out of the Tropics. Our representative told me he was very successful with his cabbages; tolerably so with maize, less so with his potatoes, doubtless owing, as he said, "to his ignorance of gardening."

Coal of a very inferior quality has been found in the interior; the natives use it occasionally for cooking, &c. But it is useless for steam purposes.

The land is generally covered with thick scrub and fern, showing here and there clear spaces of a kind of coarse grass, which grows 5 or 6 feet high. There are a few beautiful flowering shrubs, and, whilst the tree and smaller ferns abound, trees of tolerable size are found in the northern part of the island, but only small ones near the harbour. The cultivation is limited because the requirements are so small; still vegetation is most luxuriant, and the soil appeared to me of the richest kind. True, the level ground is comparatively of small extent, but there are many hundreds of acres which might readily be cultivated.

There are curious remains of apparently fortified places at Rapa, said to be the defences of the earlier warlike times. On the summits of many of the steep hills are to be seen these square fortresses, some of very elaborate construction. But what is very singular, they are mostly solid within. The stones are well squared, of very large size, and well cemented. Around or on the top of one in the interior are still the bones and skulls of a number of warriors to be found, who, they say, were starved out by their opponents. I regretted much that I hadn't time to make an exploration of these and other places myself. I may just mention that the remarkable group of rocks, called "The Four Crowns," and which on many charts are marked "doubtful," not only exist, but may be seen on a clear day from Rapa, some 40' off.

The French Resident, Mons. Caillet, gave me one piece of information, which is generally interesting, and to navigators valuable. It is that Easter Island, the natives of which have hitherto been found fierce and treacherous, rendering any attempt at communication dangerous, may now be visited without apprehension, and supplies obtained. This happy change has only recently been effected

by the influence of some courageous and benevolent French priests, who ventured upon the difficult task of endeavouring to civilise these hitherto savages.

But the coaling is done, the signal-gun is fired, and the *Rushie*, by the fiercely blowing-off steam, seems impatient to be away again; so the stragglers get on board with their spoils of coral, and fern, &c.; we cast off from the hulk, and, with captain and pilots once more at their posts, we move slowly ahead towards the sinuous pathway amid the reefs, and which, at a distance, is only indicated by the buoys on either side of it, looking like small red spots on the north of the channel, whilst black ones mark the limit of safety on the south side. I took my post in the fore-top, that I might the better see the reefs mapped out, as they beautifully were below and around us. The light gleams again on the scarcely covered rocks here and there which we have to pass, and the general interest in this short but intricate bit of navigation is greater than ever. We at length pass between the last of the black and red buoys, and are once more in clear water. We bid adieu to our skilful pilots, their boat returns to the harbour; we again go "full-speed ahead," and then have a capital view of this interesting little island as we sail and steam round it. It was a beautiful sight watching the many *varied* and *varying* forms, and tints of colour too, of the needle-like peaks and crags, and deep valleys, with their exuberant vegetation, and here and there a dark precipitous cliff, having a sparkling stream of water, like a silver-thread running down its face. But we rapidly left behind this our last stopping-place, becoming very soon too distant for us to admire it any more; and Rapa at length melted away from our view, absorbed in the purple haze of sunset, leaving us to turn our thoughts, hopes, and expectations exclusively to New Zealand.

THE PRESIDENT returned thanks to the author of this communication, which gave a description of an island of which few geographers had heard before. There were several naval officers present who had been in the South Pacific: he should be glad to hear remarks from them respecting the importance of this island as a coaling station.

Captain C. W. Hore, R.N., said he had served for about four years on the Australian station; but he had never visited the island of Rapa, though he had paid frequent visits to other parts of the South Seas. With regard to the island, there was just this connected with it,—that the Panama route to New Zealand and Australia might possibly not be of very long duration, because he saw by telegrams in that day's papers that the New South Wales Government had cancelled the contract. Therefore it was not at all improbable that, in a very short time, the Panama route would cease to exist; and on that account the island of Rapa would lose its importance. But there was one point worthy of attention, and that was the great importance of Rapa as a meteorological station in the South Pacific, similar to St. Helena and Ascension in the South Atlantic. In the Fiji and other groups of South Pacific islands—the Friendly Islands and

the Navigator Islands—we had intelligent residents and officials who were well-qualified to take meteorological observations. The island of Rapa occupied a central position in the South Pacific, and no doubt very important facts might be brought forward by having a meteorological station there. If the Panama route should cease to exist, it was more than probable that other lines of steamers would be running across the Pacific from San Francisco to New Zealand and the Australian colonies. In that case Rapa would be far out of the way, the great stopping places and coaling depôts would be further north, either the Sandwich Islands, the Fiji, or the Navigator Islands.

SIR GEORGE GREY, at the invitation of the President, briefly addressed the meeting. He observed that he should be happy to say anything that would convey information to the Society, but he had never visited this island. The only remark he could make was that the prefix "O" in all the South Pacific languages signified that the word was used to name a "place." For instance "Tahiti" really meant "distance;" but the "O" being put before it signified that the word "distance" was here used as the name of a place. In the same way "para" was the name of a fern that grew abundantly in the island: "Opara" would signify that the word was used as the name of the island.

Sixth Meeting, 8th February, 1869.

SIR HENRY C. RAWLINSON, K.C.B., in the Chair.

PRESENTATIONS.—*F. G. H. Price, Esq.; Rev. W. W. Lane; R. J. Moser, Esq.; J. H. Paul, Esq., M.D.; Alfred Richards, Esq.*

ELECTIONS.—*K. T. Digby, Esq., M.P.; Prof. T. H. Huxley, F.R.S., &c.; Richard O'Shaughnessy, Esq.; Viscount Southwell; C. Holborn Stanton, Esq.; Sir William Yardley.*

ACCESSIONS TO THE LIBRARY FROM 25TH JANUARY TO 8TH FEBRUARY, 1869. 'Geography of New South Wales, 1863.' By W. Wilkins. Donor, J. Power, Esq. 'Geography of Wurtemberg, 1862.' By E. Schwartz. Donor, J. Power, Esq. 'L'Etchaye; Pays habité par les Arabes Bichariel.' Par M. Linant de Bellefonds. Atlas. Paris, 1869. Donor, the author. 'School Atlas of Astronomy.' 'School Atlas of Geography.' By A. Keith Johnston. Edinburgh, 1869. Donor, the author. 'Handbook for Posen, 1866.' 'Handbook for Marienburg.' Leipzig, 1858. Donor, S. M. Drach, Esq. 'Physical Survey of Virginia.' By M. F. Maury. Richmond, 1868. Donor, the author. 'The Statesman's Year-book for 1869.' Purchased. 'Page sur L'Orient.' Par P. de Tchihatchef. 1868. Donor, the President.

ACCESSIONS TO MAP-ROOM, SINCE THE LAST MEETING, JANUARY 25TH, 1869.—Plan of the Caucasus, showing the Routes of Messrs. Freshfield, Moore, and Tucker, 1868. Presented by A. Petermann. Plan of the Fiji Islands, showing the Routes of Wilkes and Denham. Presented by A. Petermann.

The CHAIRMAN, in opening the business of the evening, said he was sorry to inform the Meeting that their excellent President, Sir Roderick Murchison, was unable to be present owing to the precarious state of Lady Murchison's health. In taking the chair, at the President's request, he felt that Sir Roderick's shoes were too large for him, and that any one who attempted to fill them would go with a shuffling sort of gait. However, he would do his best to supply his absence.

1. *Soundings and Temperatures in the Gulf Stream.* By Commander W. CHIMMO, R.N.

TOWARDS the latter part of the year 1868, after H.M.S. *Gannet* had been upwards of three years on the North American and West India Station, she was ordered during her homeward voyage to define the northern limits of the Gulf Stream, and to take deep soundings and temperatures within those limits.

Sailing from Halifax, in Nova Scotia, on the 1st of July, the ship passed from water whose surface temperature was 51° to that of 61° , in less than an hour, shortly afterwards to 64° ; showing that the Gulf Stream water had been reached since leaving that place.

Lat. $43^{\circ} 20' N.$; long. $60^{\circ} W.$ —To the south of Sable Island, 30 miles, a sounding was obtained of 2600 fathoms or 15,600 feet, nearly 3 miles; with a weight of 232 lbs., and the ingenious machine invented by Brooke, the rod brought up, after four hours' patient hauling. Foraminifera in their various forms, chiefly Globigerinæ. Forms and clusters of three, four, and five chambers; the interior of those fully developed was coated with an apparently fine crystallised, many-coloured, quartzose sand—of these forms some were circular—flat and plate-shaped, having a smooth interior rim (the Polycystina); the outer margin serrated, and the centre coated with the same granular particles. Others hemispherical, some single, globular; others, fragments as thin and transparent as water; intermixed with these were particles of transparent many-coloured crystals, with coccospheres in all stages of growth and size.

The towing-net collected seven species of Crustacea, one *Cornucopia*, and a *Janthina fragilis*; the dye from which latter, when placed in a wineglass of clear water, coloured the whole a rich mauve. A very small portion of this apparently impalpable adhesive mud, diluted, and placed under the microscope, showed a field of the most perfectly-formed organisms.

The ship next sailed to the western edge of the Grand Banks of Newfoundland, where a sounding of 1500 fathoms brought up what appeared, under a common glass, minute particles of transparent quartzose sand, with globular forms of calcareous formation; also some algae with parasitical attachments, probably of lime, but all formed by animal life out of carbonate of lime from ocean waters.

The temperature of this mud or "Ooze," as it will be called, was 56° ; but at a depth of 1000 fathoms the thermometer showed $40^{\circ}3$, and at 500 fathoms only $39^{\circ}5$, so that the mud probably changed its temperature in passing through a stratum of warmer water, as the sea-surface was 60° . This showed an under stratum of very cold water; there being a difference of 20° between the surface and 500 fathoms, and possibly so at a very much less depth.

Having run north of the limit of the Gulf Stream, again stood to the southward, and soon came into warmer water, at a temperature of 60° ; from a cold, damp, penetrating fog, into a mild and summer-like atmosphere; 1500 fathoms was again found, and the cup brought up the usual grey impalpable mud (ooze). The towing-net collected a beautiful float of the Nautilus, having 13 chambers, and a fragmentary valve of a delicate fluted Pecten.

The temperatures were precisely the same as in the former sounding, except that the surface was 63° , and at 100 fathoms the thermometer showed 50° ; a difference of 15° in only 100 fathoms—another proof of the Gulf Stream being merely superficial.

At day-dawn this morning, to the great surprise of every one, we saw an old Labrador friend, a huge iceberg, having a warm bath in a temperature of 62° , double that of its own. Although it was still 150 feet high, and nearly 400 immersed, it was quickly and perceptibly undermining, decomposing, splitting with loud reports, and floating away in large portions with the easterly current.

It curiously happened that this immense iceberg stood in the very spot 30 miles south of the edge of the Grand Bank, where not only the deepest waters of the Atlantic were supposed to be, but where we intended to get a sounding to ascertain if this were the fact: the result showed it was not so.

Sail was furled, steam got up, and the *Gannet* ranged up as near as was prudent under the lee of our chilly friend; and in the midst of a thunder storm, with Brookes' rod and weights, obtained at a depth of 1450 fathoms the same "Ooze," disproving the idea of the deepest water being here. This depth appears to be not only the usual one, but also the slope of the Banks, as well as the general character of their formation.

By the temperatures here obtained, the same stratum of cold arctic water was passing under the warmer waters of the Gulf Stream. The rod brought up a small portion of feldspar with glittering particles of mica, evidently deposited there by icebergs from Davis Strait, and that very recently.

We now sailed east for the spot where Lieut. Sainthill, in lat. $42^{\circ}37'$ N. and long. $41^{\circ}45'$ W., obtained, in 1832, 100 fathoms on

sharp rocky bottom, bringing up on the arming of the lead "fine bluish ashes;" and he was under the impression that he was over a submarine volcano in a state of eruption. At 2 P.M. on the 12th of July we reached this position, and with a heavy weight 4300 fathoms of line ran out, and no bottom!

It was somewhat remarkable that about this place, within a radius of some few miles, many indications of shoal water had been from time to time seen and reported, one having as little as 35 fathoms on it. To one of these, called the "Milne Bank," with only 80 fathoms on it, we were now steering. It had been found by H.M.S. *Nile*, in 1864, on her homeward-bound voyage; and, under most favourable circumstances, soundings of 80, 90, and 100 fathoms, "fine sand and oaze" brought up.

Also, about this vicinity, the currents are found very strong, and a little further east very variable in direction; sometimes running with a velocity of 2, 3, and even 4 miles an hour to the eastward, and in some places forming a complete "race." If neither banks nor shoal-water exist here, it is not easy to account for this additional effort of the Gulf Stream; unless, indeed, it is the mass of water brought from the South Atlantic by the south-east trades, adding to its volume and to its velocity.

Lat. $43^{\circ} 30' N.$; long. $38^{\circ} 50' W.$ —At 4 P.M., on the 15th of July, we were on the 80 fathoms! The red and weight of 230 lbs. let go, and as each 100 fathoms ran off the reel it caused some excitement, as at each fathom it was hoped the Bank would be struck. 2280 fathoms, 13,680 feet ran out. There was no bank there. The red brought up "oaze" abounding in animal, vegetable, and mineral!

Here the thermometers were sent down to ascertain specially if cold water existed at any depth. One thermometer burst at 1400 fathoms. Water was brought up from a depth of 1500 fathoms,* containing small and delicate particles of algae of various bright colours, showing, probably, that light had penetrated to that depth; but there was not a sign of animal life.†

Another sounding for the Bank was tried, and 2600 fathoms obtained; the rod bringing up from the same vast cemetery countless

* Temperature 42° .

† The temperature of the air was 77°

" " " " " " 73°

At 100 fathoms below it was $62^{\circ} = 10$ degrees less

At 300 " " " " $55^{\circ} = 20$ "

And at 1000 " " " " 42° or 30 "

so that cold Polar waters were passing underneath at 200 fathoms below the surface.

thousands of its dead, and of the same character as those found a day or two previous at a nearly similar depth, except that the Globigerinae were in clusters, and in those *fractured* there was a hard, compact, crystallised, fine sand.

The fractured Globigerinae in this sounding were very beautiful, showing margins of vertical crystal formation, clear as water, the fractured globes or cells containing (apparently) minute quartzose sand. Thinner glass-like forms of air-like globules, in irregular order, were probably Coccospheres.

A small convex portion illustrated beautifully the radiating perforations or canals of the Foraminifer, both direct and diagonal; and some few irregular particles of diatoms flexible and multi-form.

One young Globigerina, in which the cells were quite transparent and thin, none of these have any granular deposits in their interior.

Some of these also show the horizontal layers of each wall, added layer to layer—the outer ones thickening, and the external layer becoming coated with tubercles; the interior are of an enamel transparent smoothness.

The heat in the Gulf Stream was found at times very oppressive, and reminded us all of the climate of Trinidad in the wet season. The thermometer in the shade was 82° , in the sun 96° ; the warm vapour arising from the heated water made one feel languid, lazy, and sleepy, and was very debilitating.

By the temperatures obtained from actual observation at 300, 500, and 1000 fathoms, the waters were in all cases warmer than the corresponding depths north of the Gulf Stream. This is, of course, very natural, but it is as well to have it from actual observation; and this would argue in favour of bodies of warm water being brought up from the coast of Africa by the south-east trades, from the coast of Spain by the N.E. trades, and, accumulating with those of the Gulf Stream on the position assigned to the Milne Bank, assisting materially in adding to its velocity there.

Stood north again for Polar waters, which were soon felt by the temperature of the sea-surface changing in $2\frac{1}{2}$ hours 14° —from 72° to 58° ,—giving again the northern limits of the Gulf Stream. The air also gave proofs of this again, for in an hour we passed from a close uncomfortable heat to a chilly cold, which compelled all hands to put on warm jackets; and, as a natural consequence of this change, soon followed a dense fog!

Ran for the Flemish Cap, on which we sounded and obtained 80 fathoms. Stones, feldspar, and various coloured quartz, with some few Foraminifera even in these shoal waters.

Sounded midway between the north part of the Flemish Cap and the Grand Bank, to ascertain if there were any connection, or if they were separated by a deep channel. 250 fathoms was obtained, showing that it was part of the bank, but having a rocky nucleus, about which the soil brought down by the ice accumulates; but the Polar current over it is sufficiently strong to keep the rock bare. On two occasions it bent and turned the iron cup of the weight in 90 fathoms; here at 250 fathoms the temperature of the sea was 38° , while at the surface it was 50° , the air being the same. The south part of the Cap is not, however, united to the Banks for 700 fathoms, and no ground was obtained between them.

Lat. 46° .—On the parallel of 46° latitude, at a distance of 25 miles from the edge of the bank, sounded in 1000 fathoms, bringing up large quantities of rounded particles of quartz of various colours.

Here a section of the slope of the bank was made, showing its ascent, formation, and the nature of these vast banks. From 1000 fathoms—of coloured, quartzose sand, to 650—of silicious spicules of sponges; then to 450—green mud, 150—quartzose sand, 60—stones, 55—stones, sand, and fish-bones, and the latter told us that we were on the Grand Banks.

Passing over and searching for the "Jesse Ryder Shoal" of 4 fathoms, which was found *not* to exist, we put over the dredge and dropped on a perfect colony of star-fish (*Ophiocoma*) of all sizes, from half an inch to 3 inches in diameter,

In a very dense fog steered for St. John's, Newfoundland, where we arrived on the 24th July to rest for a few days after the work in the Gulf Stream. It was cold, raw, and foggy; but we were very glad to drop anchor in its snug and secure harbour, free for a while from all the cares, anxieties, and perplexities necessarily attending deep-sea sounding.

Having again prepared lines, instruments, and chronometers for a second voyage, sailed on the 27th August for the north extreme of the Gulf Stream, and which was reached two days afterwards—the sea temperature rising suddenly from 53° to 61° .

Lat. $44^{\circ} 3' N.$; long. $48^{\circ} 7' W.$ —Here soundings were again obtained with rod and heavy detaching weights in 1650 fathoms, bringing up Foraminifera in all stages, whole and fragmentary, having from two to six cells or chambers in clusters, spherical, plate and flat-shaped *Polycystina* (diatoms), with a few spicules of sponges, as well as some coccoliths.

Temperatures of under strata of currents were obtained, again showing that at 1000 fathoms the water was $39^{\circ} 5'$, and at only 50 fathoms below the surface (which was 61°) it was 43° , or 18°

colder!—air being 61° : another proof of the bare superficial Gulf Stream.

Another cast of the lead on the supposed position of the Sainthill volcano quite disproved the existence of this vigia within a radius of many miles.

We were approaching for the second time the Milne Bank, of 80 fathoms; and although 2300 fathoms was obtained on it a short time since, yet there was still a hope that the second attempt would be more successful, particularly as a telegram had reached me from England to the effect that "there was no doubt of the Milne Bank, as bottom was brought up *three times*;" and indeed so it would appear. But on the 3rd of September (lat. $43^{\circ} 40'$ N., long. $38^{\circ} 50'$ W.) the lead was again let go and 2700 fathoms obtained, the rod bringing up a small but precious particle of Foraminifera.

The towing-net gave another rich haul of *Hyalea*—*Atlanta* and *Spirula*—with three specimens of *Nautilus cornucopia* (I believe the latter to be *Operculate*). In no case could the remains of those creatures which had lived on the surface be found in the vast cemetery at the bottom; probably long before they reached so great a depth their softer parts had decomposed and their shells assisted in forming one of the component parts of the ocean, carbonate of lime, or became food for their hungry neighbours the Mollusks.*

It is curious to find how the different species of these delicate ocean-shells have their own special haunts and feeding-grounds. In one place the *Atlanta* are taken in numbers, with scarcely any others; in another a net full of *Hyalea tridentata*; then quantities of *Spinosa* or *Radiata*; lastly, a bag of *Janthina fragilis*; but these latter are more generally distributed than others. All these are found more numerous on the surface at the sun's rising and setting, and very abundant during light showers of rain.

Near the supposed position of this bank we sounded at short distances for some days with more than a thousand fathoms of line; but in no case was there any indication of this bank. The last effort to sound in 1000 fathoms north of this supposed bank will not easily be forgotten; it was obtained under many and great difficulties. The sea had risen to a fearful height in a very short time, which threatened to roll all the boats from the davits. My steam-cutter *Torch* did start. There was scarcely any standing on the deck. All the thirty-five men on the starboard side, while hauling the line in, lay down, or rather were thrown down on the line.

* Towards the end of these investigations I was compelled to alter my opinion on this subject, an interesting sounding having brought up from 2000 fathoms the shells of those Pteropoda living on its surface.—W. C.

Lat. $43^{\circ} 30' \text{ N.}$; long. $38^{\circ} 5' \text{ W.}$ —Sounded again with heavy weights in 2000 fathoms, bringing up Foraminifera in various stages of growth; and what gave interest and value to this sounding, was the fact that icebergs had reached these limits, proved by the presence of a piece of stone, three-quarters of an inch in size, deposited undoubtedly there by a berg, and brought up in the valve.

Lat. $43^{\circ} 43' \text{ N.}$; long. $37^{\circ} 47' \text{ W.}$ —On the 5th of September a sounding was taken at 1930 fathoms; the rod came up with its spring broken, but retaining sufficient of the bottom to show that it was down. Foraminifera, the usual deep-sea characteristic, appeared, mostly young and small, with transparent cells: about 5 per cent. of all these are free from fracture, all the remainder fragments.

Before leaving the vicinity of this supposed bank, the temperatures here obtained with new and delicate thermometers at 2000 fathoms was 42° —rather a higher temperature than expected. The air was 68° ; the sea-surface 69° ; while at 100 fathoms it had fallen 10° , and at 400 20° ! At 1000 fathoms it was 43° , after which it fell but 1° in 1000 fathoms.*

Great quantities of Salpæ and Meduse came up entangled with the line, doubtless caught in its quick descent of 500 fathoms in $3\frac{1}{2}$ minutes.† Their orange-coloured stomachs, situated in the centre of the transparent gelatinous sacs, came in quite perfect on the line.

Lat. $43^{\circ} 39' \text{ N.}$; long. $36^{\circ} 46' \text{ W.}$ —On the 6th September we gave our departing and final cast of the lead in this vicinity, getting 2060 fathoms; the rod bringing up Foraminifera, small stones, and some Diatoms.

We were now leaving the regions of the Globigerinæ and Lime formations, changing them for those of Silicious deposit. Nearly all in this last sounding were Diatoms, with but few Globigerinæ. A thermometer was sent down to 2000 fathoms and proved the last temperature at the same depth, showing $42^{\circ} 5$.

To complete a series of 100-fathom temperatures, advantage was taken of a fine day with smooth water—both indispensable requisites in sounding for temperatures, as the smallest jerk or vibration moves the indices and the reading is destroyed, the results being only deceptive. The thermometer went down to 1500 fathoms, and in no instance did it show less than $42^{\circ} 5$, fully proving the high temperatures obtained on former occasions, and this would prove the entire absence of an under Polar current here; and further, that the waters of the Gulf Stream here mixed with other waters, decreasing

* Showing a great uniformity of temperature after the first 500 fathoms.

† Or equal 14 feet in 1 second, which equals 1 mile in 6 minutes.

thereby its strong easterly set, which was here found on many occasions to be variable. The temperature of the surface was 71° .

From the authority of a few scattered observations, it has been asserted that the water of the ocean, at a depth of 12 feet, was of a higher temperature than at the surface. This was proved to be correct, although remarkable, by 45 carefully-obtained observations between Halifax and this position.

Of these 45 observations, 26 are warmer, 10 are colder, and 9 have the same temperature. The warmer are in favour of the colder, 16° in the whole, but in no one instance greater than $1^{\circ}5$; and the greatest and most constant are noticeable to the east of the Milne Bank, after the rapid current of the Gulf Stream had been passed.

In the Pacific, off the west coast of America (the Isalcos Mountains), the temperature at 12 or 15 feet below the surface has been found to be 10° or 11° higher. This, I presume, is caused simply by excessive evaporation, as I have often found there the difference between the wet- and dry-bulb hygrometer to be 9° , and on one occasion 11° .

Lat. 46° N.; long. $29^{\circ} 40'$ W.—9th of September, being on the position of a vigia, a very satisfactory sounding of 1650 fathoms was obtained: first disproving the existence of such a danger, and secondly bringing up the most interesting and remarkable specimen of the bottom; showing that those minute creatures which live on the surface do assist in forming the bottom of the ocean. Foraminifera and Diatomaceæ surrounding six dead *Hyalæa* shells, all perfect. These, to have been taken on the bottom, must have been dead, and for a valve the size of a shilling to have entrapped six of these, they must have been numerous indeed; the whole area of the six was greater than the valve itself—they must, therefore, have been in such quantities as to overlap one another. *Hyalæa* were also taken on the surface in the towing-net; so that here was a successful illustration that these lived on the surface and were buried after their period of existence on the bottom.

This was a shoal-sounding compared with those around it, and silicious animal formations now became more numerous; the *Coccospheres* and other delicate forms exactly resembling the *Nautilus*, chambered, but devoid of the siphuncle by which the latter elevates and depresses itself at pleasure, by exhausting or filling its chambers with water. Thirteen chambers were counted in one form.

In this sounding, also, animal remains were seen, and could hardly be mistaken; the feelers or radiating processes from the tubercles of the canals were regularly radiating, and at the point where the chambers intersect was a mass of minute spawn-like globules.

Inorganic fragments of some size were also seen, having a smooth concave impression, intersected with dark lines. In no instance are the shells of the *Hyalina*, taken alive on the surface, so large as those found dead on the bottom; so that it may be possibly inferred that they have died at their full growth, at the limit of their permitted existence.

A very interesting and valuable sounding was made about 180 miles E.N.E. of the last, in 1180 fathoms, showing a less depth of water by 200 fathoms than in any part of the Atlantic (not approximate to the shore). A small portion of the bottom "Ooze" came up attached to a pig of ballast, which was the weight used on this occasion.

Lat. $47^{\circ} 11'$ N.; long. $23^{\circ} 14'$ W.—On the 12th September the favourable weather, with a dead calm, induced us to sound, and a cup-lead of 112 lbs. reached the bottom at 2000 fathoms, bringing up a full cup of pale cream-colour "Ooze," Infusoria, like ice-cream, and quite as cold. In this sounding were many-shaped and various-formed *Globigerinae*, hemispherical and globular; also many spheroidal organisms, in one specimen of which we counted thirteen chambers.

A fractured portion of a *Globigerina* cell showed that the interior wall was formed of perpendicular transparent four-sided cells, while the exterior was perforated by narrow canals running perpendicular to the frame. The temperature at that depth was still 42° .

Our sounding had now ceased, and this novel and interesting work had finished.

It is worthy of remark that the general character of all these thirteen soundings, varying in depth from 80 to 2700 fathoms, spreading over an area of upwards of 10,000 square miles from Sable Island to the Azores, shows a remarkable uniformity both in respect of temperature and sea-bottom. One chief object throughout was to ascertain if in any of these organised forms animal life still existed. They were placed for fourteen days under a powerful microscope, and in no one instance was either animal life or animal remains visible except in the two doubtful instances recorded. Therefore it may be safely concluded that these minute creatures do not live where found, at the bottom of the ocean.

Hundreds of the animal organisms of *Foraminiferae*, *Globigerinae*, *Coccoliths*, &c., with which the soft light brown and yellow mud abounded, were, after being diluted with clear water, separated from the muddy particles and broken under the lens with a finely-pointed penknife. It required some force to break them, and the sharp

shock and cracking was plainly perceptible; in no single instance was life or movement visible.

The mud, when dry, is either of a pale yellow marl, light brown, or greenish-brown colour; the former containing chiefly Globigerinæ or calcareous formations, the second Silicious or Diatomaceæ, and the last silicious spicules of sponges. All are apparently soft mud until rubbed between the fingers, when gritty particles are detected. These are the Globigerinæ in great variety of shapes and numbers, some being formed in concentric layers round a transparent centre.

In the deepest waters and most distant from land were the greatest numbers of perfect specimens of the Globigerinæ found, in soundings 12 and 13; and as the water decreased in depth and neared irregularities, so they became fragmentary. These facts suggest that, either at the lesser depth some wave-movement, or, may be, current, fractured these delicate organisms, or that their cases were broken by mollusks or other devouring agents for the softer matter in the interior, and the shelly portions then allowed to descend to the bottom.

With many experiments in water, it was found that not only were the Globigerinæ of much more specific gravity than the water, but that they sank with a rapidity truly wonderful and invariably with the convex side downward, and in that position (which was contrary to which they lived) remained so.

In passing the soundings a second time under the microscope, some new forms were detected, which will be seen in the drawings, and these are for the most part of silicious formation, some having a thin, irregular, and broken coating of lime; others as transparent as glass.

The thin membrane-lining in some of the Globigerinæ were also noticed, but these could hardly be the remains of the once-living animal.

Some recent Globigerinæ, which appeared discoloured (a light red), were broken; but no minute granules were inside.

In the second examination of the Globigerinæ I was compelled to alter my views with regard to the rounded aperture (which I thought may be formed by an annelid), but which I found in every form, larger or smaller, according to age and size. In some instances the apertures were in the two last chambers, the lips of which were smooth and rounded off with a transparent glass-like finish.

2.—*On the Gulf Stream.* By A. G. FINDLAY.

In the early part of 1853 I presented to the Society, in this room, some remarks on the Current Systems of the Ocean—at that time, as it still is, a comparatively neglected subject. In that paper I advocated the views that each great ocean has a circulatory system within itself, and that there was also a constant intercommunication and interchange of the whole surface-water of the entire oceans.

Of this vast circulatory system, the Gulf Stream is the best known, as it is the most remarkable of these currents.

At that period it was fully believed that the Gulf Stream flowed in one mighty and majestic current of warm water from the surface to its bed, at great depths; and thus there was but little difficulty in believing that its tropically-heated waters could reach the shores of Europe with only a partial loss of the warmth they had acquired. But the first actual experiments, announced soon afterwards, dispelled at once all preconceived notions as to its vast magnitude.

The progress of deep-sea sounding, and obtaining the temperature at enormous depths, as well as determining the nature of the ocean-bed, although great, has not kept pace with the requirements of science.

The facts that have since been brought to light, have placed the subject in so much obscurity that it may be really said that we know very much less of the entire system, than was safely argued upon when only the surface-waters were considered. And I think that it would be impossible to generalise any system of ocean-physics which shall satisfactorily account for all observed phenomena, further than it is almost certain that there is some sort of circulation and interchange taking place in the lower strata, as can be sufficiently traced in the surface-waters of the ocean.

Now, as much vague surmise and loose assertion has of late been made respecting the possible effects of the Gulf Stream and its influence on the climate of this and adjacent countries, during the late period of unusually high mean temperature, I thought that it might be well to draw the attention of the Society to first principles, and to show what is actually and accurately known of this great current, as derived from later researches. I will, therefore, by the aid of the diagram, point out some of what may, as Mr. Bates has said, be termed "popular errors."

The waters of the North Atlantic circulate, as I have said before, around a central area—the Sargasso Sea; and the western branch of this circuit—that portion which issues from among the West India Islands, after recurving from the intertropical to the extratropical

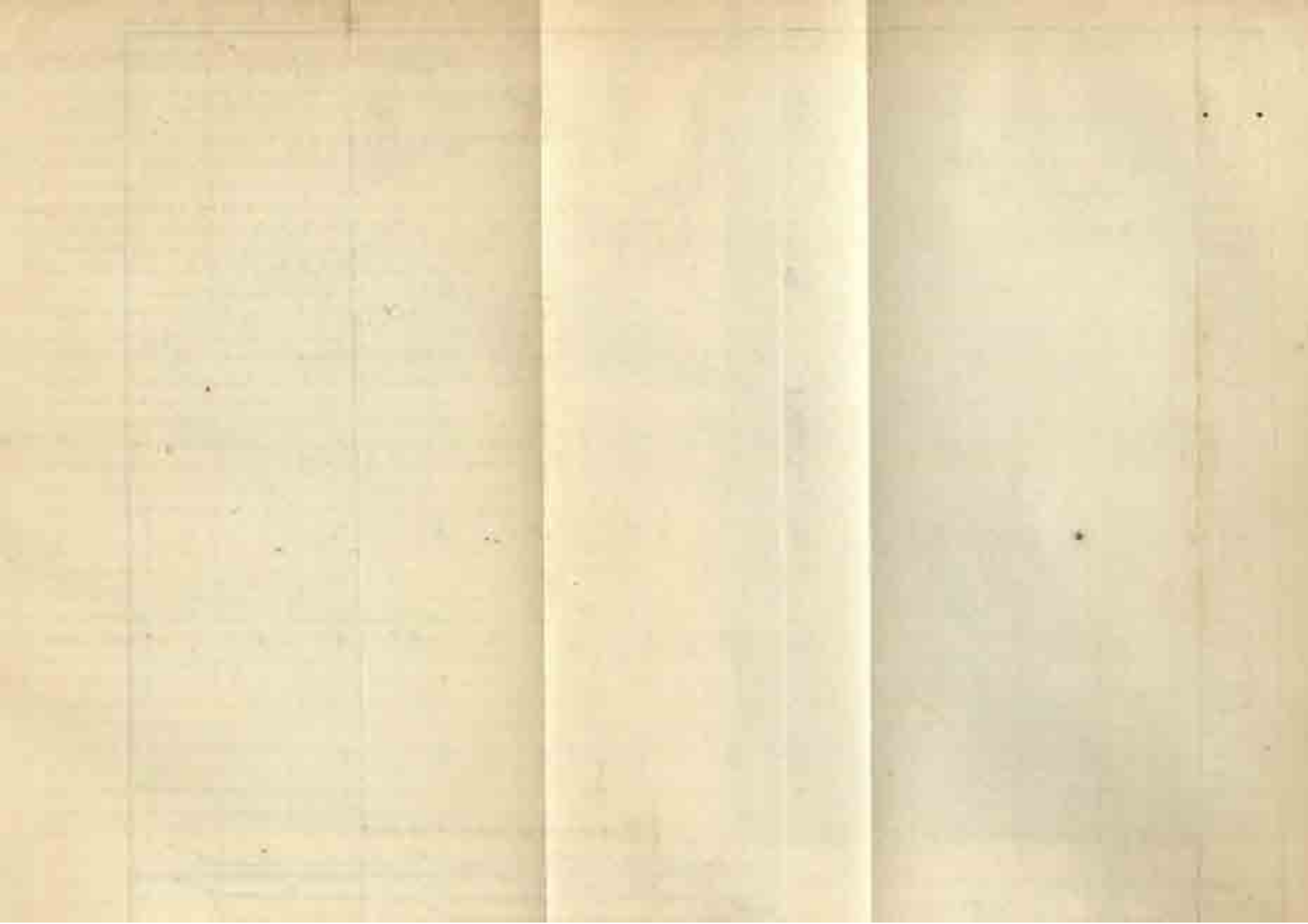
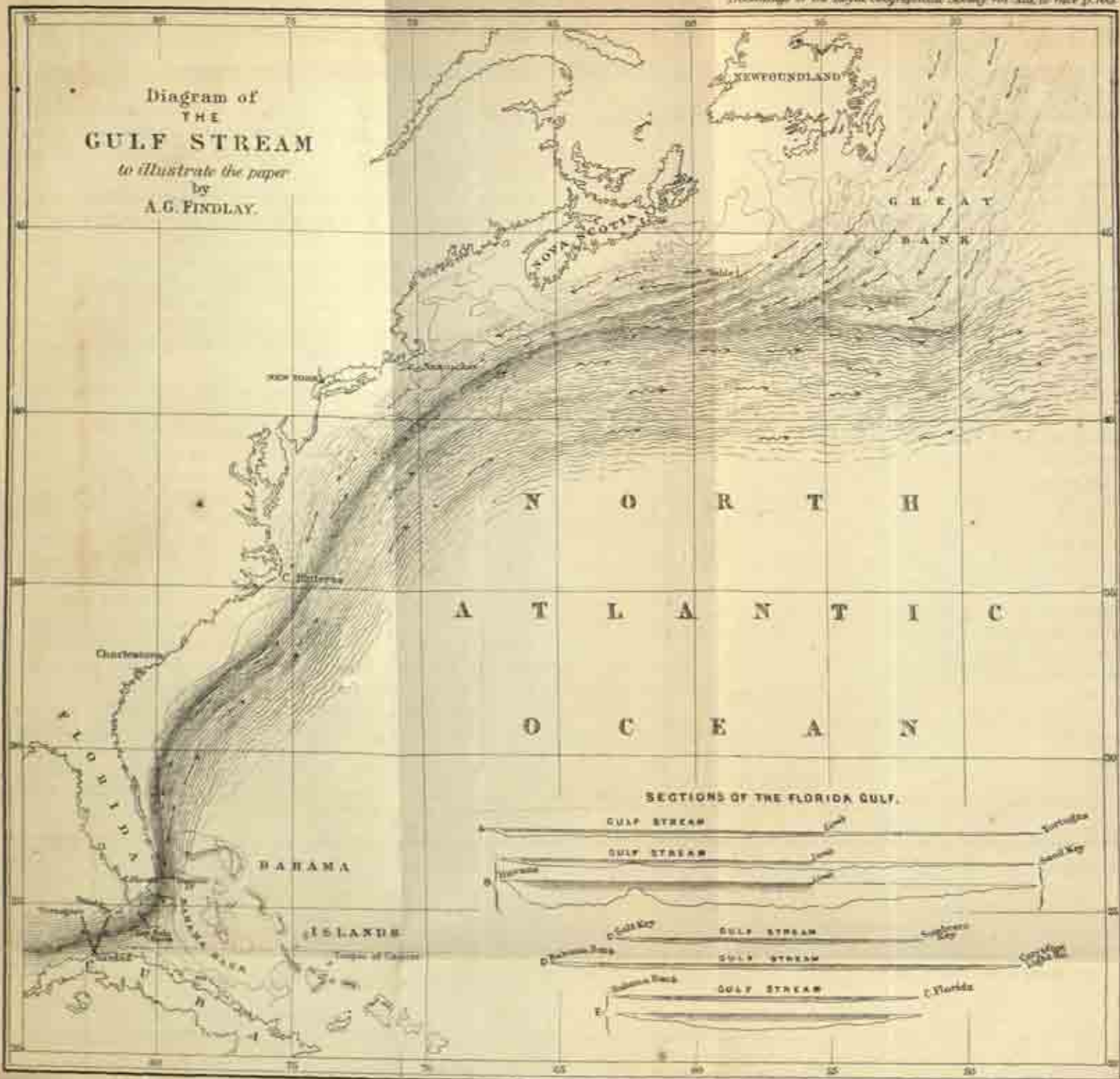


Diagram of THE GULF STREAM

to illustrate the paper
by
A. G. FINDLAY.



regions—is well known as the Gulf Stream or the Florida Stream. Now, as this mighty current has been traced and measured, both in volume and velocity, along the coast of the United States as far as Nantucket, we can, from the known amount of each quantity at its entrance into the strait, easily measure its possible effects on distant regions.

The Gulf Stream, at its commencement is, confined between the coast of Florida and those of Cuba and the Bahama Banks, and no other water can reach it during this part of the course. The first section—that at its westernmost limit—was examined in 1858, between the Dry Tortugas and the entrance to the Havana, a distance of 98 miles, which showed that the water gradually deepened from the north side to the maximum depth of 770 fathoms, within 5 miles of the Cuban shore. The next section will be more suitable for my demonstration.

In 1866 it became necessary to lay an electric cable between the Florida Keys and the Havana, and the United States Coast Survey, under Mr. Hilgard, undertook the examination of the bottom. The line of soundings was carried from Sand Key to the Moro Castle of Havana, in a diagonal line across the main strength of the stream, where it first enters the Channel which gives its name—a distance of 82½ miles. On the diagram this section is represented in its actual relative dimensions of breadth and depth; but as these are not very visible, an exaggerated section of five vertical to one horizontal is given. To this, and the next, particular attention is drawn, as they contain the clue to the real character of the Gulf Stream.

Starting from the northern side, the bottom falls away in terraces, nowhere abrupt, to a depth of 504 fathoms at the distance of 29½ miles, and to 687 fathoms at 34 miles, nearly half over. The maximum depth of 845 fathoms is found at 45½ miles from the north side; from this to the Cuban shore the bottom is hilly and precipitous, and at about 20½ miles from the Moro the summit of a submarine mountain ridge is reached, which rises about 2400 feet above the bed of the strait, that is from within 380 to 320 fathoms of the surface. This mountain ridge has been traced for more than 12 miles parallel with the axis of the strait, and falling precipitously towards the south, deep water continuing close up to the south shore.

From the northern side the bottom is rocky with coral, to the depth of 300 fathoms; at depths beyond this, it is of that peculiar grey mud, or granular mud, sometimes with red patches, the ordinary type of the organic life of the ocean-bed.

The temperature of the water, varying according to the season,

from 80° or 84° on the surface, sinks to 60° on the summit of the ridge, above mentioned, and is only 45° at the bottom— 13° above the freezing-point of fresh water.

In the northern half of this section, above the terraces south of Florida Reefs, the water lies almost motionless, and it is only over the deep cañons of the southern half of the Gulf that the Gulf Stream flows to the eastward.

It is thus only 40 miles broad in its greatest strength. Its depth cannot exceed the summit of the submarine ridge, and it was found, on hauling in the sounding-line, that the upper moving stratum is scarcely more than *one-third* of the maximum depth. So that the actual sectional area of the Gulf Stream, at its highest temperature and greatest velocity, is not more than 5 to 8 square miles.

Such a well-determined fact shows how entirely fallacious were those speculations formed prior to its establishment. It will be no great sacrifice of preconceived opinion, to curtail the Gulf Stream of those widely extended and majestic features with which it was formerly endowed.

The data thus acquired as to its initial course is exactly borne out by further explorations beyond this.

Passing by the next section between the Sombrero Lighthouse and the Salt Key Bank, about 120 miles further to the eastward, where it is 45 miles wide (examined in April, 1859, by Commander Craven, U.S.N.), which showed that its maximum depth is only 600 fathoms, and the greatest depth still being on its southern side, and also the next, between the Carysfort Lighthouse and the Great Bahama Bank (examined by Commander Craven, in May, 1859), 63 miles wide, maximum depth about 500 fathoms, we come to the most important, because it is the crucial test of the magnitude and character of the Gulf Stream. Each of these sections is on the diagram before you, and they must speak for themselves.

The narrowest part of the Gulf Stream is also by very much the shallowest part of its course—a fact almost incredible, but that it rests on a solid basis. It was obtained by Commander Craven in 1855. The distance between Cape Florida and the Bemini Isles is 45 miles, and the maximum depth is only from 300 to 370 fathoms. The temperature of the water at the bed was only 49° ; so that here again the warm water does not extend more than *one-third* or *one-half* the entire depth, demonstrating the cubical amount of warm water passing over this line to be nearly the same as that shown in the first section, from which this is distant about 250 miles.

Nothing is said here about the cold polar currents in a reverse direction, which have been traced in this its strongest and warmest

portion; but a very slight amount of reflection will raise a doubt as to whether such a bulk of water could reach our shores, and transport over so wide an area the influence of the tropical heat of the Gulf of Mexico.

A slight glance at its further progress will, I think, convert this doubt into a certainty with every one. It is confined between the Little Bahama Bank and the Florida Coast, and from this point to its entrance into the Gulf is about 330 miles.

Hitherto its course has been one undivided stream, lying over a very cold substratum, probably flowing in a reverse direction, and with cold counter currents appearing near its margin. To the northward it pursues its course, as is well known, generally parallel to the inequalities of the United States coast. But it here appears only as one of a series of parallel bands, the warmest of four belts, having one within it, and two (or more) to the east and south-east of it, which warm bands are separated by as many belts of colder water flowing in an opposite direction; and within or inshore is the very cold Arctic current, also flowing southwards. The warm belt of the true Gulf Stream is so pressed upon the coast that the exactly defined separation between its dark blue and tepid waters, and the lighter and much colder Arctic stream, has been termed the "Cold Wall,"—the division being so nearly perpendicular and well marked to great depths; and this characteristic is preserved as far as—and perhaps beyond—New York Harbour entrance. The outer edge is very vaguely defined, and in its northern portion it imperceptibly blends with the ordinary temperature of the ocean in the same latitudes. Beyond this it turns much more to the eastward, and having arrived at the meridian of the Nantucket Bank, about longitude 68° or 69° , its limits become still less defined, and when it reaches the meridian of 50° , or that of the Newfoundland Banks, its southern margin cannot be detected.

The inner or western edge is very sharply defined throughout its course along the coast of the United States. Why it is so pressed upon the cold Arctic current, with which it does not mix, has never, to my knowledge, been well accounted for.

I might here draw attention to the speculations of Mr. Leighton Jordan, which will very satisfactorily explain it, if his premises be accepted.

He argues that the *vis inertia* of the ocean will account for this, as for most other currents; and this is deserving of much attention. In few words, this pressure of the Stream upon the coast is owing to the diurnal rotation of the earth, which drives the land upon the

ocean waters, the latter being less subject to the axial motion of the earth. For our purpose this very definite feature of its left-hand margin being very much the warmest and strongest will bear out more fully the view I am now advocating, as it is that portion more subject to further disturbance, as shown presently.

The length of its course after leaving the Gulf of Florida to the tail of the Newfoundland Banks is about 3500 miles, and its breadth has increased from about 70 miles off Charleston, 120 miles off Cape Hatteras, at Nantucket, to perhaps 300 miles; and its mean annual velocity is 65.5 miles per day in the Strait of Florida, 56.0 miles off Charleston, 36.0 to 46.5 off Nantucket, and 28.0 miles south of the Newfoundland Banks. So that I have calculated that it would take from twenty to twenty-five days in the main strength of the current to reach Nantucket, or fifty days to arrive off the Newfoundland Banks. Its surface temperature has cooled down from 80° to 84°, to 58° in winter, and from 75° to 62° in summer; and, I think, it is evidently a physical impossibility that the volume of warm water which passes through the narrows of Cape Florida could ever make such an impression without some other addition to its strength. The whole bulk of water above 70° in the Florida Gulf would not make a film 100 feet thick at Nantucket or 50 feet at Newfoundland. I think it could be demonstrated that the existence of some of the outer warm bands above alluded to, is owing to a drift, which curves to the northward outside the Bahamas. But the observations recorded in the space north of the Bahamas show no evidence of such a drift, which it is difficult to believe does not exist. Having reached the point south of Newfoundland, a new phase is arrived at. It here encounters the Arctic Current coming down the coast of Labrador throughout the year, and during the spring and summer months transporting the deeply-floating icebergs far into its northern edge, and this northern or left-hand edge has been before shown to be its strongest and most well-marked portion. The struggle between the Arctic and Tropical currents is here so strongly marked that the interlacing of the warm and cold waters, as shown by the thermometer, has been compared to the clasped fingers of the hands; and the veins of each of these distinctly marked ocean-waters are so well defined that a few miles or even yards is sufficient to carry a ship out of or into a tropical influence.

One feature of this down-bearing current is very distinctly marked, and deserves especial attention. On the eastern side of the Grand Bank it is so powerful that according to the surface isotherms it penetrates from 150 to 200 miles southward of its

general limit, and therefore entirely intersects the surface-waters of the easterly stream, for that breadth, which, as before stated, is the most important part of its course.

I contend, therefore, that by the time the Gulf Stream has reached this limit its original character is so thinned out and expanded, and its specific character is so destroyed from this cause, and from the neutralising effects of this Labrador current, that it can be no longer recognised beyond this cold-water gulf, which cuts off, as it were, its further progress, and which, it is manifest, it can neither bridge over nor pass under. The well known north-easterly drift which reaches the shores of Northern Europe, which is warmer at 300 miles north-east of the Newfoundland Banks than the Gulf Stream south of them, must be produced by other causes, and has a distinct origin: it is therefore time that it had a distinct designation.

But the evidences of the existence of the Gulf Stream pass beyond this. The Gulf weed it has drifted; the cocoa-nuts and tropical produce which are thrown upon the coast of Iceland and Norway, the same evidences of its transporting power which are at times found on the south coast of Iceland, and more abundantly in the space south of Cape Farewell, and the drifted mahogany-log which made the Danish Governor's dining-table, on the west coast of Greenland, were carried by other powers than that of the Gulf Stream.

It would take, from the data I have reckoned, 150 days to carry any object from the Banks of Newfoundland to our coasts, or 200 days from the West Indies, and this fact also, combined with what has been said before about the actual bulk of the Gulf Stream, will demonstrate that it is impossible such effects can be attributed to it, because in addition, it is continuous with that stream which flows southward down the coast of Portugal, the eastern branch of the circulation of the North Atlantic surface-waters.

How, then, can the phenomenon of our warm climate be accounted for? The reason is most simple and obvious. The great belt of anti-trade or passage winds which surround the globe northward of the Tropics, passing to the north-eastward, or from some point to the southward of west, pass over the entire area of the North Atlantic, and drift the whole surface of that ocean towards the shores of Northern Europe, and into the Arctic basin, infusing into high latitudes the temperature and moisture of much lower parallels; and which alone would be sufficient to account for all changes of climate by their variations, without any reference whatever to the Gulf Stream.

A few words as to the ocean-bed and its inhabitants. The facts cited by Lieutenant Chimmo, combined with those of other observers in most parts of the ocean, demonstrate, as I believe, one important fact, that the whole of the ocean waters are in course of interchange, and that, like the atmosphere, there is a perpetual movement from the surface to the bottom.

If otherwise, and the lower beds are quiescent, how do those minute creatures, almost deprived of motion, exist? They would soon exhaust all their requirements from the waters within their reach, if fresh supplies were not brought to them by this circulatory system.

The same organisms are found all over the areas experimented on, whether under the Arctic circle or under the heated Tropics, and the ascertained temperatures are nearly the same in all cases, proving that there is a similar water-climate throughout.

Another evidence of this circulation is the universality of the composition and characteristics of ocean water. If it were not so, each region would possess a different fauna, having a different description of medium to exist in. It is the same from the surface to the bottom. This was demonstrated by the star-fish brought up *alive* between Greenland and Iceland, from the depth of 1260 fathoms (1½ mile). If these animals had been brought through water of different constituent character, they would have died during the hour it took to haul them in.

Although what has been thus briefly stated may be antagonistic to the generally received opinion, I hold that it cannot be altogether contradicted, and, instead of offering any further explanation of known phenomena, I recommend the subject to the zeal of future observers.

Our present knowledge is almost a blank, and the matter deserves every consideration.

The CHAIRMAN, in inviting a discussion on the Papers, remarked that there were two distinct matters for consideration. One was the hydrography of the Gulf Stream, and the other the general question of submarine geography. Both subjects were of great interest, and he hoped they would both receive elucidation that evening. He was afraid that many of the Fellows, like himself, had so grown up in the belief that the temperature of our country was affected by the Gulf Stream that they would find a difficulty in doubting it. Nevertheless, Mr. Findlay's arguments tended to shake that belief. Still, he should like to hear the cause of the peculiarly mild temperature of the West of England explained. If it were due merely to currents of wind, he would have thought the same mildness might have been perceptible far more inland than it was. He hoped that as Professor Huxley, one of the first authorities in England on all questions of submarine animal life, was present, he would be kind enough to state his views with reference to these interesting forms of animal life, some of which had been brought up from a depth of 2700 fathoms.

Submarine geography was not merely interesting in that point of view, it was also a practical question. Geographers ought to obtain as accurate a knowledge of the surface of the globe under the sea as they possessed of the surface of the globe above the sea. The deep-sea soundings that were now being carried on in different parts of the globe had the object of ultimately arriving at such a knowledge. It was not until we possessed this knowledge that we should be able to traverse the oceans with telegraph cables, for there was no reason why we should not lay down submarine lines in all directions with the same facility that we now employed aerial telegraphs. As a contribution to this, he regarded Lieutenant Chimmo's paper as meriting great consideration.

Captain SHERARD OSBORN, R.N., said Lieutenant Chimmo's paper was a most valuable addition to our knowledge. Previous to his soundings off the southern extremity of the Newfoundland Bank the Gulf Stream in that quarter was reported to be unfathomable. Lieutenant Chimmo had sounded to the bottom on every occasion he attempted but one, and then probably the bight of his line was carried away by currents. Moreover, by careful observation, he had disposed of a very alarming feature which was said to exist in mid-ocean—the Milne Bank, named after the gallant officer who was said to have discovered it. It was a pleasant thing to be assured that no such bank existed, and for this they were indebted to Lieutenant Chimmo. He had, moreover, confirmed our previous knowledge respecting the level of the ocean bed between the coasts of Europe and those of America. We might take the mean depth to be about 2000 fathoms across the North Atlantic Ocean. And he had disposed of the theory that the Gulf Stream had an enormous scooping effect, wearing a deep furrow in the sea-bottom. As Mr. Findlay had shown, its depth might be limited, as far as the warm water indicated. But he himself did not see why the stream should be limited to warm water—why it should not combine both hot and cold. He still believed in the existence of the Gulf Stream, from the enormous quantity of wood and drift that he had noticed far away to the north; and he believed that the Gulf Stream did ameliorate our climate very considerably—that the mildness of our climate was owing not merely to the effects of warm air, but to the effects of water of a high temperature as well. There were very few sailors acquainted with the sea between the Azores and the Land's End who had not noticed tropical species of fish accompany drift-timber there. Wherever we found the dolphin and other fishes of warm seas, we might be sure that the temperature of the water was pretty much the same that it was in the tropics. Then there were many other streams of a similar character in different parts of the globe. There was that remarkable stream on the east coast of Africa which flowed from Cape Guardafui for 2000 miles, almost into the harbour of Bombay. That had recently been explored by an officer in our service, and he had obtained soundings throughout its whole length. There was a similar stream, called the Black Stream, between China and Japan, which was just as marked at the edge as the Gulf Stream. Beyond this there was little or nothing known of it: he did not believe it had been sounded, or that its limits had been marked. All these streams ran parallel to each other, nearly from south-west to north-east; they formed three great oceanic streams, as it were, which flowed through the wastes of ocean with outlines as marked as the Mississippi or the Orinoco. Here was an immense field laid open to the investigation of the hydrographer; and he only hoped that members of his profession, while the sword was laid aside, would, encouraged by our Society, throw their enterprise and intelligence into so promising a field of discovery and usefulness.

Professor HUXLEY said no naturalist who had looked broadly at his subject could fail to be greatly interested in physical geography; no man could have a conception of the bearing of a great many most important biological

facts who had not paid very considerable attention to this department of science, and to all those great features of oceans and rivers which were either the causes or the effects of the phenomena of physical geography. He proposed, therefore, to make remarks on the two subjects submitted to their consideration that evening: the Life of the Sea-bottom, and the Gulf Stream. With regard to the deep-sea soundings which Lieutenant Chimmo had described, speaking with every respect for the zeal and high intelligence which that gentleman had displayed in his observations, and knowing practically how difficult it was to make such observations while at sea, he still might be permitted to remark that they made no substantial addition to what had already been established by a considerable number of observers with regard to the character of the Atlantic sea-bottom. In some respects he ventured to think—having been favoured by the Hydrographer to the Admiralty with the particular soundings that Lieutenant Chimmo had brought home—that he had not quite clearly interpreted the facts. There could be no doubt that animal remains were contained in a very large proportion of the *Globigerina* shells. By proper methods of treatment, by dissolving them in acids, you may get out the soft bodies. Not only so, but Professor Frankland, to whom he had submitted portions of such soundings, had determined, by the processes of organic analysis, the existence of more than 1½ per cent. of organic matter in these soundings; which 1½ per cent. of organic matter could be clearly identified by the microscope in two shapes: in part as *Globigerina* shells, in part as a confused network of simple organisms, distinct from the *Globigerina*—one of the most remarkable of simple organisms, to which he had given the name of *Bathypus*. That simple organism—one of the simplest forms of animal life—we now know covered the whole area of the North Atlantic in all the regions that had yet been surveyed. The very admirable soundings in the Indian Ocean which had been made by Captain Shortland, to which Captain Sherard Osborn referred, had enabled him to extend his knowledge of that organism. From the Arabian Gulf, at a depth of 2800 fathoms, along the whole of the east coast of Africa, round the Cape of Good Hope, and along the west coast until it joined the North Atlantic again, he could trace throughout the whole extent, at these prodigious depths, that that sea-bottom was covered with a network of organic matter. There could be no sort of doubt that living animals exist at the bottom of the deepest seas yet explored. How they lived there, how they acquired their store of food, was one of the most curious questions of organic chemistry; one which we could not solve at present. But it was the fact that there were two distinct constituents in this Atlantic mud: one of them like the organisms which he had described and the *Globigerina* living on the sea-bottom, and the other silicious remains of organisms living near the surface, and which only reached the bottom after they died, for their skeletons had sunk down through the great depth of sea-water and mixed with the living creatures at the bottom. He looked upon these two results as now definitely acquired to science. He might remark, perhaps, in reference to something which was let fall by Captain Osborn, that, as far as he had been able to examine the deep-sea soundings from the Arabian Gulf, the character of the bottom was, in the main, very similar to that of the great Atlantic plateau. Over most parts of it the sticky, adhesive *Globigerina* mud exists in large proportion, and in certain parts *Globigerina* are replaced by an excessively fine and attenuated sand. But in all the specimens which had been brought up by Lieutenant Chimmo there was an entire absence of everything but the very finest and softest calcareous or silicious matter. With regard to the hydrographic question of the extent of the Gulf Stream, he had listened with very great attention to the facts and argument which had been brought forward by Mr. Findlay, and he must confess he had arrived at two results unfavourable to the purport of the paper. The first was that he did not find

in the statements brought forward any facts not to be met with in the works of Maury; and still more particularly in that excellent essay upon the Gulf Stream which was published a year or two ago by Kohl, and to which he would recommend every one who took a particular interest in the subject for a perfect plethora of facts connected with the phenomena of the Gulf Stream. The second conclusion was, that the arguments which had been brought forward did not seem to justify the important conclusion arrived at. Indeed, he thought a considerable amount of fallacy lurked in those arguments. Mr. Findlay drew attention to the very small extent of the Gulf Stream between the peninsula of Florida and Cuba; and he asked the question, how was it credible that so small a volume of water as this should give rise to the great mass of warm water which was found taking a north-eastern and easterly course in the northern part of the Atlantic? Now, if the velocity of the water which passed through the Straits of Florida were the same as the velocity of the water in the region of Newfoundland, that query would have considerable force. But it seemed to him to fail, unless we took into account the fact that the velocity of the water passing through the Straits of Florida was three or four times greater than that of the stream in the North Atlantic. These facts regarding the Gulf Stream had been well established by the careful observations and surveys of the American Navy; and he must say it was a disgrace to this country that, with our vast naval resources, we could not produce anything to compare with these great American surveys. But, leaving that aside as a mere incident in the question, he would say that the consideration of relative velocity, is one of great importance in view of the difficulties put before us. Another argument which he would bring against Mr. Findlay's conclusions was based upon the very admirable map of the Gulf Stream published last year by the Hydrographer of the Admiralty. Every one who knew that map would say it was a document of extreme value, a first-rate authority; and in that map the currents continuous with those of the Gulf Stream were traceable, with diminished velocity, to the northern points of the coast of Scotland. He did not think any one who looked at that map, and traced out the gradual diminution of that stream, could have any doubt that he was dealing with a phenomenon that had one and the same cause. Another argument quoted by Mr. Findlay from another author was so singularly at variance with what we knew of ordinary physical laws, and with what was very well known with regard to the Gulf Stream in particular, that it could not stand its ground for a moment. It had been suggested that this easterly trend of the Gulf Stream was due to the Earth in the northern part of America slanting it on as it turned round.

MR. FINDLAY: It was Mr. Leighton Jordan's argument.

PROFESSOR HUXLEY: The argument of Mr. Leighton Jordan appeared to be that the water, not partaking fully of the movement of the Earth, was, so to speak, shunted on to the eastward by the action of the eastern side of North America. In any case, an explanation of that kind could not possibly apply. We all knew, as a matter of physics, that the water at the equator partook of the motion of the Earth at the equator. It consequently had a greater velocity from west to east than the surface of the Earth in more northern latitudes. We also knew, in accordance with the ordinary laws of physics, that if that mass of water were transferred northwards, it would, for a considerable time, keep its primitive velocity. The consequence would be that, as it travelled from west to east faster than the Earth was travelling in a corresponding latitude, it would trend away to the eastward; so that, so far from the land forcing the water to the eastward, it was the water that trended to the eastward, leaving the Earth behind it.

MR. FINDLAY thought his arguments had been misunderstood. He had carefully calculated the velocity of the Gulf Stream at its initial point, and the

amount of water carried forward day by day. The velocity was exceedingly well known; its annual mean and its monthly mean were also very well known. The stream took 25 days to reach Nantucket, 50 days to reach the Newfoundland Bank, and 200 days to reach the western coast of Europe. From its known sectional area between Florida and Cuba, he contended it was impossible such a stream could spread over the whole of western Europe up to Iceland, as far as the northern coast of Norway and Spitzbergen, and to other places where there was a comparatively mild climate. He repeated, such a body of water passing from the Gulf could not produce those effects on the climate of the whole of western Europe without being aided by some other causes. Then there was the fact that the warmest point of the Gulf Stream was on its western edge: the warmest water being pressed upon the American coast, along which the polar current was running south. He wanted to know why that was? why the warmth should not be diffused more to the eastward? It was only a suggestion of Mr. Leighton Jordan that the axial rotation of the Earth might account for the phenomenon in some degree. But, apart from that, he would contend that that small body of water would never cover the whole of the west coast of Europe; it was the great winds which blew from the south-west in that part of the Atlantic that produced a drift towards the coasts of Europe. Moreover, there was the drift of water round the Bahama Bank, which joined the Gulf Stream; the Gulf Stream, in fact, could form only a fractional portion of the circulation.

The CHAIRMAN, in closing the discussion, said the great point was to bring men of science and practice together, for truth was elicited by the efforts of the two. He was much indebted to Professor Huxley for giving him the chance of still indulging in those ideas that he had always entertained with regard to the effect of the Gulf Stream upon our climate. He must say he did not think that Mr. Findlay had absolutely dissipated that belief.

The following paper, announced for reading, was taken as read:—

- 3.—*Journey to the Confluence of the Mantaro and Apurimac.* By ANTONIO RAIMONDI, Hon. Corresponding Member of the Royal Geographical Society.

This will be printed entire in the 'Journal,' vol. xxxviii.

Seventh Meeting, 22nd February, 1869.

MAJOR-GENERAL SIR ANDREW SCOTT WAUGH, R.E., F.R.S.,
VICE-PRESIDENT, in the Chair.

PRESENTATIONS.—*Charles H. Stanton, Esq.; Lieut. Henry Trotter, R.E.*

ACCESSIONS TO THE LIBRARY FROM 8TH TO 22ND FEBRUARY, 1869:—
'A Visit to the Southern Galas (East Africa).' By T. Wakefield. 1866. Donor, the author. 'Emigration to Venezuelan Guyana.' By L. Clark. 1868. Donor, the author. 'A History of the Abyssinian Expedition.' By Clements R. Markham. 1869. Purchased. 'Anales de la Universidad de Chile.' 'Historia jeneral de la Republica de Chile.' 'Bibliografia de la Literatura Chilena.' 'El Terreno

Carbonifero de Coronel." Por Don P. del Barrio. 'Poesia Chilena.' Escrito por A. Valderrama. All presented by the University of Chile. 'A Political Survey, 1868.' By M. E. Grant-Duff, M.P. Donor, the author. 'Meerut and Umballa Railway, opened 1869.' Donor, the Secretary of State for India.

ACCESSIONS TO THE MAP-ROOM SINCE THE LAST MEETING OF FEBRUARY 8TH, 1869.—Photographic Views of Mount Sinai and the Vicinity, nine in number. Presented by the Rev. F. W. Holland. Map of the Province of Buenos Aires. By S. Salis, &c. Presented by Mr. F. Torromé. Plan of the City of Buenos Aires. By S. Salis, &c. Presented by Mr. F. Torromé. Ordnance Maps, 415 sheets, on various scales.

Previous to the reading of the papers, the CHAIRMAN stated that the Council in their meeting that day had passed the following minute, expressive of sympathy with the President in his recent domestic bereavement:—

Extract from the Minutes of the Council of the ROYAL GEOGRAPHICAL SOCIETY, 22nd February, 1869.

"The Council of the Royal Geographical Society desire to offer to their President the expression of their sincere sympathy with him on the occasion of the lamented decease of Lady Murchison. They recognize the deep and active interest taken by Lady Murchison in science generally, and more especially in the proceedings of the Royal Geographical Society; and in thus tendering their sincere condolence to Sir Roderick Murchison, they are fully sensible of the irreparable loss sustained by him in this bereavement.

"ANDREW SCOTT WAUGH, Major-General R.E.,

"Chairman of the Meeting of Council."

The CHAIRMAN further informed the meeting that a reply had been received from Sir Roderick Murchison to the following effect:—

"MY DEAR SIR ANDREW, 22nd February, 1869.

"Accept my warmest thanks for yourself and my kind friends of the Council who have expressed their condolence for me in my heavy affliction. As I cannot attend the Council or the evening meeting, I beg of you to explain to both bodies why I am necessarily absent from my post.

"Yours sincerely,

"RODERICK I. MURCHISON."

The meeting having expressed unanimous concurrence in the sentiments of the Resolution,

The CHAIRMAN said the paper about to be read was one of especial interest, both in an astronomical and a geographical point of view; it was written by Staff-Commander Davis, who was a member of Sir James Ross's famous expedition towards the South Pole in the *Erebus* and *Terrar*. The transits of Venus would be useful as affording facilities for determining the distance of the sun. He himself took particular interest in the subject, as the pursuit of his own profession had led him to be occupied for some years in measuring the figure of the earth. Although the transits in 1874 (Dec. 8) and 1882 (Dec. 6) would afford a rare opportunity for very valuable observations,

unfortunately the sun would be very far south, and therefore observers in the northern hemisphere would be excluded from favourably observing the transit. Astronomers, however, had devised several methods for taking the greatest advantage of the occasion. At the Astronomical Society a paper had been read by the Astronomer Royal, in which he had pointed out the positions from which the phenomena could be best observed. These stations being, for the most part, *in terris incognitis*, brought the subject within the legitimate domain of the Royal Geographical Society.

The following Paper was then read by the Author:—

On Antarctic Discovery, and its Connexion with the Transit of Venus in 1882. By Staff-Commander J. E. DAVIS, R.N., F.R.G.S.

[ABSTRACT.]

THE author prefaced his paper by stating that the Circumpolar Chart, exhibited by him in illustration of his subject, was compiled from many authorities, with a very considerable and important addition from the President of the Royal Society, in the curves of magnetic dip and declination, which were part of the results of many years of toil and study by General Sabine; it was not, however, his purpose to allude to them that evening, but he was sure they were not misplaced, as they were of the deepest interest to the physical geographer. The materials for the diagrams in connection with the transit of Venus had been kindly furnished him by the Astronomer Royal previous to reading his late paper before the Royal Astronomical Society.

The paper commenced with a sketch of the history of discovery in Antarctic regions, the author believing that the public were not so well acquainted with South Polar as with Arctic explorations. While the names of Northern discoverers were "familiar in our mouths as household words," but comparatively few had ever heard of those of the South; and even the renowned Cook was more remembered for his discoveries in the Pacific than for his bold push towards the South. Had it not been for the coming transit of Venus in 1882, the Antarctic might have remained neglected for another century. A brief account was given of the various discoveries from that of South Shetland by Dirk Gerritz in 1599 to the voyage of Captain James Clark Ross. Cook made no discoveries in the South, but his voyage was of this consequence—we knew that for any large tract of land we must look further south. The expedition of Bellingshausen was, in like manner, of not so much importance from its discoveries as from its non-discoveries. Weddell, an officer in the Royal Navy, who in 1823 reached the high latitude of $74^{\circ} 15'$, deserved the greatest credit for venturing so far south in such small vessels at so late a period of the season. Whatever might be the

extent of our future discoveries in the South, the name of Weddell would ever hold its own for gallantry and daring. The voyages of Biscoe, Balleny, and Kemp, were then mentioned, and the discoveries made by them enumerated,—especially that of Enderby Land by Biscoe, and so named by him in honour of the enlightened and public-spirited merchant, Mr. Enderby, at whose cost his explorations were undertaken. The author then described the interest which was shown in the phenomena of terrestrial magnetism in 1838, which resulted in the Government fitting out the *Erebus* and *Terror*, for the purpose of pursuing the investigation in the southern seas, the command being given to the discoverer of the North Magnetic Pole, Captain J. C. Ross.

The ships left England in September, 1839, and, carrying on their magnetic observations through the voyage, arrived at Hobarton, Tasmania, in August, 1840. On his arrival, Captain Ross found that two expeditions—one French and the other American—had anticipated his intentions, and been south in the direction of the magnetic pole. The French expedition under Captain Dumont d'Urville, after discovering a portion of land on the Antarctic Circle, returned to Hobarton, having been absent seven weeks. The author then reviewed the evidence of the discoveries of land by Captain Wilkes, and explained the error into which that discoverer fell, in departing from the course usually adopted by navigators, of mapping such land only of which no doubt could exist, and leaving the remainder as "appearances" for confirmation or otherwise by others. Some portion of the land, he believed, really existed, and might safely take the place of the blank spaces upon our map. The merit of the discovery of the continent—if it be such—was due to Balleny, who mapped out "Sabrina Land" the previous year. Captain Ross's three voyages south were then described, and the barrier offered to further discovery, which ran east and west through 25 degrees of longitude. The highest southern latitude reached was $78^{\circ} 10'$.

The object sought by the observation of the transit was well known to be the ascertainment, to be deduced therefrom, of the exact distance of the earth from the sun—calculations of this distance at present varying to the extent of three or four millions of miles. The most simple mode of explaining the process by which this is to be accomplished was by stating that all that was required for the calculation was the exact angle subtended by the radius of the earth from the sun; and as we could not get to the sun for the purpose, it must of necessity be done from the earth by means of parallax, or the apparent change in the position of the sun by a change of posi-

tion on either side of the earth's centre, the amount of the sun's parallax in dispute causing the error in distance being but little more than the third of a second of an arc. We are assured by astronomers that the best mode of ascertaining the required distance is by observing the moment of ingress and egress of the planet on the sun's disk from opposite parts of the globe; and it was easy to understand that if the ingress and egress of the planet be observed from points of the meridian on either side of the centre of the illuminated side of the earth, the moment of contact would be accelerated in the one case, and retarded in the other; and that this acceleration and retardation would increase in ratio to the distances of the points of observation, being greatest at spots most divergent from the centre of the illuminated arc, or where the sun is on the horizon; but as it was not possible to observe it from those positions, a position as near to them as possible is to be obtained. There were two methods by which the transit could be effectually observed:—1st. By absolute longitudes from four stations, viz., one for acceleration by parallax, and one for retardation, for the ingress, and the same for the egress. For this method, accurate determinations of longitude were necessary—an error of one second in time would vitiate the result. The other method was by observing both ingress and egress from two stations—one for acceleration by parallax, the other for retardation; the great advantage of this method over the other being that the accurate determination of longitude was not an absolute necessity. In the transit of Venus in 1882 one such station was to be found in the North American colonies, but the other could be obtained only in a high southern latitude, and this brought the two parts of the subject together. The diagrams exhibited would show the relative value of a station parallactically, which was denoted by factors of which 1.0 represented the point of greatest value, and the decimals the lessening value; the highest altitude of the sun and the highest factor of parallax being the best position for observing the transit. Thus the normal point was useless, the sun being on the horizon, while at Capetown the parallactic value was too small. At Kerguelen's Island the altitude of the sun at the ingress would be about 12° , while the parallactic value is large (about 0.97); at Crozet's, altitude 24° , parallactic value 0.9, both very good stations; but another element had to be considered, viz., meteorology; and these stations, with those at other localities, as the Mauritius and islands near, were only adapted for the first method, and dependent on absolute longitude. By the diagrams it would be seen that if a position could be found in a high southern latitude, the second method could be adopted; and for this purpose

the Astronomer Royal had suggested two points—one near Sabrina Land, in seven hours East longitude, where the ingress and egress could be observed on either side of the nether pole, at an altitude of about 5° , the other on the coast of South Victoria, in latitude 72° , or in a higher latitude if possible. The first position was not propitious, as the high land would be immediately between the observer and the sun, and with the low altitude it was probable the sun would not be seen; but the other position afforded a better prospect of success: still there was one difficulty attached to that, viz., the utter impracticability of reaching it in time to make the observation, and time would be necessary to arrange the instruments, &c. But the author did not consider this difficulty insurmountable: it could be overcome by landing the party the previous summer in January, and by so doing the advantage to science would be great, as a valuable series of observations in meteorology and other branches, through an antarctic winter, would be obtained.

The *modus operandi* suggested by Captain Davis was that two vessels with steam-power (for which he deemed the hydraulic propeller worthy of consideration) should leave England in June, 1861, having on board the equipment, in men and instruments, for observing the transit by both methods; on the passage out the parties for the first method should be landed on the selected stations, and in December or January the ships would proceed south, in longitude about 140° East, working their way through the pack-ice towards South Victoria, pass Possession Island, and carefully examine Coulman Island, in latitude $73\frac{1}{2}^{\circ}$, and, failing to find a harbour or suitable position for landing on that island, return at once to Possession Island (where Sir James Ross effected a landing), and land the party with huts, instruments, and provisions for two years; the ships then returning north, and, after visiting the other observing parties, again proceed south about the same time as the previous year, and, after embarking the southern party, return and pick up the others and return to England. Regarding the stations meteorologically, the advantage was decidedly in favour of the southern ones, at which the chances of obtaining the observation or not were pretty evenly balanced. When fine, the atmosphere was so clear that mountains at a hundred miles' distance would readily be believed to be not more than twenty; while such navigators as had passed Kerguelen's or Crozet's had described them generally as being wrapped in a mantle of mist; and although it would be scarcely fair to draw conclusions from a winter residence, still, having been two to three months in that season at Kerguelen's, in which he had been absent

in an open boat for a fortnight, it had left vivid impressions of the humidity of the climate on the author's mind.

Of the value to be attached to the observation of the transit, astronomers could best judge; but in following the example of the Astronomer Royal, by quoting the words of his illustrious predecessor, Halley, the author could not do wrong:—"And heartily could I wish observations of this phenomenon to be made by several in divers localities—as much for the establishment of a firmer belief through a general agreement as lest a single observer should be frustrated by intervening clouds—of such a spectacle as I know not that men of this or the following age will again see, and upon which depends the certain and satisfactory solution of a most remarkable and otherwise insolvable problem. And to such subtle examiners of the heavenly bodies, after our decease, are the observanda committed; again and again do we commend to them that, encouraged by the memory of this work of ours, they should strenuously—even with their whole powers—apply themselves to the thorough fulfilment of the observation, and for them we devoutly pray and wish all propitious circumstances; above all, that they may not be deprived of their most anxiously desired view by an inopportune obscuration from a clouded sky; and that, finally, the discovery of the magnitudes comprised within the narrower limits may redound to their lasting honour and glory."

If this great national work, of which we were to be so proud, this remarkable and otherwise insolvable problem, was to be accomplished, it was Captain Davis's opinion that those who were to be instrumental in its accomplishment should go to school at once, and *that school was the North*. Without previous experience in ice-navigation in the North, would Sir James Ross have been so successful in the South? His firm belief was that every man in that Southern expedition that had not previous experience would have turned back; he would have done so himself. No doubt in 1881 many would be ready and willing to go, but he did them no injustice in saying that, without previous experience in ice-navigation, the voyage would prove a failure; and now that North Polar research was revived, and foreigners were straining every nerve to reach the Pole, was England not to make an effort to hold her own? He trusted that an expedition would soon be sent, and all looked to the Royal Geographical Society as the lever to produce the movement; shame would be on us if a foreigner were to step in and carry off our Polar honours; but it would not do to think of, and he trusted that, even in this utilitarian age, some men in power would be

found who did not consider money thrown away to advance Geographical knowledge, who would advocate the cause of polar discovery, and keep up the breed of polar men who added so much to the peaceful honours of our country.

The Paper will be published *in extenso*, with chart and diagrams, in the 'Journal,' vol. xxxix.

Captain RICHARDS (Hydrographer to the Admiralty) said the question brought before the meeting had been fully considered in an astronomical point of view by Professor Airy, and discussed at a late meeting of the Astronomical Society. It was the business of the astronomer in such cases to point out what the geographer was to do. This duty had been performed by the Astronomer Royal, and he had no doubt that when the necessity arose the Government would respond to those suggestions. The transit of 1882 was yet a long way off, and there was therefore, humanly speaking, plenty of time to prepare for it. If it be necessary in 1882 or 1881 to go to the Antarctic continent, he had no doubt that the Government would be prepared to carry out the undertaking. But it must be remembered that circumstances were different now from what they were when the *Frisby* and *Terror* were sent out to find the North-West Passage. The Admiralty could send out such an expedition in these days, but these undertakings were not now among its functions. Whether or not such enterprises were carried out in the present day rested with the country at large. Naval officers were not less ready than formerly to go the South Pole or to the North Pole, but it did not rest with them. However, he had no doubt but that the country which sent out the expedition to observe the transit of Venus in 1769 would be prepared to act in a similar spirit in 1882. He was not warranted or authorised to say what the Admiralty would do in the matter, but he was persuaded that they would do everything in their power to carry out the project which had been recommended.

Captain SHERARD OSBORN had been for some months collecting data for a paper upon the same subject as that which they were then discussing. He was, however, delighted to find it dealt with by one who, from having been an actor in the scenes he had described, wrote *con amore* of the region in which he had played so prominent a part. No doubt, when the time arrived, men would be found willing to go, but still the necessary experience might be wanting. He agreed with the writer of the paper that such experience must be acquired in the North, where Ross attained that knowledge which enabled him to proceed so far towards that south pole which they would soon be wanting to reach. Instead of keeping our navy, as at present, ever at anchor, it would be far better to send our sailor officers to learn endurance amid the hardships of the polar regions. Though we were allowing the Swedes and Germans at present to lead the way, he trusted the day was not far distant when the Geographical Society would put its shoulder to the wheel to induce the Government to send out an expedition again. One hundred years ago, when George III. was king, the First Lord of the Admiralty, addressing Commodore Byron, particularly alluded to the happy circumstance that his Majesty's kingdom was then enjoying a long peace, and that as there were certain continents and islands in the great Southern Sea worthy of being discovered and explored, and brought to human ken, he was of opinion that the opportunity should be turned to account. Cook was subsequently sent out, and well it was for the world, and better still for England, that such was the case. Looking at the proposed expedition which the Hydrographer seemed to promise should one day be sent out, he hoped that the expedition when sent to the Antarctic regions

would be empowered not only to observe the transit of Venus, but to make a wider exploration like that of Cook, and so to bring home to us a more extended knowledge of the geography of the Southern Hemisphere, and especially of that science of which we are only at the threshold—the geography of the sea.

Admiral COLLINGWOOD said he quite agreed with Captain Davis that it was absolutely necessary the expedition should be landed the previous summer. He did not think it would be advisable to send out ships with the idea of their wintering there; but he could not see any objection to the party remaining, as previous observations had proved that there was an abundance of fresh food to be obtained. But the most important point of all was that of the positive necessity of educating men to the work. If men were sent there who had not previously experienced what ice-navigation was, the expedition would turn out to be a failure. He therefore sincerely hoped that the Society would urge upon the Government the necessity of maintaining that acquaintance with ice-navigation which had so long tended to the honour, the credit, and the renown of this country.

Sir L. M'Clixtock was glad of the opportunity of joining in the recommendation that those who are hereafter to carry out the interesting undertaking which they had met to consider, should now be sent to the North, so that experienced officers may not be wanting when their services are required. He himself should be sorry in thirteen years' time to have to make an antarctic voyage, as he considered that he would then be past the age when he could conduct it in a manner honourable to himself or beneficial to the country; but he was quite ready to start now, if necessary, with ships of instruction, taking a number of young lieutenants who were lingering about at home, and teach them how work was to be done in the ice regions.

Admiral Sir E. Belcher said it was originally arranged between Sir James Ross and himself that whenever the antarctic expedition was fitted out he (Sir E. Belcher) should be the second in command, but the Chinese war prevented the fulfilment of their intentions. He was perfectly satisfied that during the time the sun is above the horizon the expedition would find the atmosphere of the antarctic regions clear, and find every facility for carrying on their observations. He agreed with Captain Osborn that it was advisable at once to begin to educate men for the work; but he could not forget that Parry and Ross, and many other celebrated voyagers, did their work manfully and well in the arctic regions on the first occasion without having had previous experience. Sir L. M'Clixtock had said he should not like to be sent away to the polar regions thirteen years hence, but he (Sir E. Belcher) would be quite ready to go. He was not yet so old as Franklin was when he started on his last expedition, but the latter never turned round and said he was too old. He was perfectly satisfied that when the occasion arose men would be found to do the work as well as if not better than such work had ever before been done.

Dr. RAE thought it was evident that some experience was needed for such work as the expedition would be called on to perform, because those explorers who had not been accustomed to arctic voyaging had invariably taken whaling men to show them how to manage the vessel. It was not an easy thing to manage a ship or boat in ice-navigation. A man need to be prepared to work the vessel at a moment's notice in such a manner as to clear a sudden danger, and to be ready for everything. A man going to the arctic regions should be of that period of life when he was full of energy and capable of enduring great hardships and privations, so as to enable him to be the actual as well as nominal leader of his men in all cases when great powers of endurance were called for. It was all very well so long as he could remain in the ship, but when he was compelled to take to the land the case was very different. He (Dr. RAE) had been told that, before Sir John Franklin started on his last cruise he was asked how he would manage if the ships were lost. His answer

was "Then I am a gone man," because he knew he would not be able to endure the privations of a land journey.

General LARNEY after remarking on his good fortune in meeting on that occasion with an old comrade of the *Terror* (Commander Davis) from whom he had parted thirty years ago, and whom he had not seen in the interval, said he wished to refer to that portion of the paper in which reference had been made to the American Antarctic Expedition. He had the good fortune to meet Commodore Wilkes in Washington, in 1842, and to hear from his own lips an account of his discoveries, and he now claimed for that eminent officer some reasonable degree of credit. He was convinced that Commodore Wilkes was perfectly sincere, and guided by the impressions of himself and fellow voyagers in laying down on his chart appearances of land. That he was not far wrong was proved by the fact that the coast line, as he marked it out, varied but little from that which had been ascertained to be the real truth. With regard to the national sense of the importance of observing the transit of Venus on the South Polar continent he considered that much was yet to be done to arouse public opinion in this country. To count the cost in a narrow spirit was unworthy of our national greatness.

Admiral ORMANNEY thought this subject had not been brought before the public one hour too soon. No school had trained so many valuable officers as that of arctic and antarctic explorations. He deplored the fact that there was nothing at the present day to remind the nation of the services rendered to his country by Sir James Ross, one of the greatest navigators of this century,—the man who discovered the north magnetic pole. Such a state of things was disgraceful to the nation. The portrait of Cook might be seen in the Hall at Greenwich, but nothing was there to remind the public of Sir James Ross. He hoped the Geographical Society would not long hesitate to do something to commemorate the services of that great navigator.

The CHAIRMAN informed the Meeting that quite recently the French Government had appealed to the Academy of Sciences for their opinion as to the most suitable localities for observing the transit of Venus in 1882, and the preparations required for that purpose. They would, therefore, agree that the subject had not been introduced a day too early.

Commander DAVIS, in reply, said he entirely differed from Admiral Belcher in the view he took as to the want of experience for such an expedition as that which was now proposed. If the opinions of arctic voyagers were taken, they would be found generally to coincide in the view that the command should be given to a man under fifty years of age. With regard to General Lefroy's observations on the discoveries of Commodore Wilkes, all he (Commander Davis) wished to say was that the American officer had recorded appearances of land as *terra firma*. Had he carefully marked the supposed discoveries as appearances of land, his account would not have been open to the objection which had been raised.

ADDITIONAL NOTICES.

(Printed by order of Council.)

- 1.—ROUTE FROM JELLALABAD TO YARKAND THROUGH CHITRAL, BADAKHSHAN, and PAMIR SIEPPE, given by MAHOMED AMIN of Yarkand, with Remarks by G. S. W. HAYWARD.*

No.	NAMES OF PLACES.	DISTANCE In Miles.	REMARKS.
	From Jellalabad to—		
1	Kooner	12	A large town. River Kooner. A fort.
2	Ammar	12	A large place. A fort. A stream from the Hajour direction joins the Kooner River near this place. Road is along the left bank of the Kooner River as far as No. 27 "Chattebol."
3	Shal	8	A fort. About 200 houses.
4	Sanghar	4	A fort. About 100 houses.
5	Birkot	4	A fort. About 50 houses.
6	Nurunt	8	A large place, containing about 500 houses, and a fort. Fertile country. Rice grown in great abundance.
	Rafak Zinhardar	3	Steep ascent of about $\frac{1}{2}$ a mile. The river "Bashghalak," which runs through the Siya-pesh Kafiristan, joins the Kooner River at this place.
7	Kalkatak	5	The Chitral territory commences. A fort. About 100 houses.
9	Kila Durus	4	A fort. A large place, having about 1000 houses.

* These routes were printed among the Appendices to the 'Report on the Trade and Resources of the Countries on the North-Western Boundary of British India,' by Mr. R. Davies, which was printed at Lahore in 1862. The Report itself was afterwards reprinted for the House of Commons; but, by an unfortunate exercise of discretion, the Appendices and Maps were not reprinted, and these valuable adjuncts are consequently difficult of access in Europe. Mahomed Amin was the guide of Adolf Schlagintweit on his last unfortunate journey.—[Note by Col. H. YULE.]

ROUTE 1.—FROM JELLALABAD TO YABKAND—*continued*.

No.	NAMES OF PLACES.	Distance in kos.	REMARKS.
10	Kis	6	A village. About 100 houses.
11	Burūz	8	A village. About 200 houses.
12	Chumūr Kun ..	5	A village. About 100 houses.
13	Yughūr	3	A village. About 100 houses.
14	Danin	6	A village containing about 100 houses. The city of Chitral, also called " <i>Kashkaro</i> " (Kashkar of the maps),* is about a koss distant from this place on the other bank of the river. From Danin a road goes through Chitral up to the Kotal-i-Darah Pass across the Hindu Kush into Badakshan; this route is given as No. 2 further on.
15	Koghūr	20	A village containing 200 houses. On the way 2 places are passed, called "Kah" and "Kari," where the road is very narrow.
16	Maroi	6	A village. About 100 houses.
17	Barina	6	A village. About 100 houses.
18	Rehūr	12	A village. About 200 houses. Road narrow.
19	Bani	12	A village. 200 houses.
	Avi	5	A large village. A road from this place across the river leads to Shagram, Miragam, two large places.
20	Maatneh	15	A fort. 200 houses.
21	Chivinj	4	A fort. 50 houses.
22	Bepur	8	A village containing about 100 houses.
23	Khurūz	6	A village. 50 houses.
24	Pour	9	A village. 50 houses.

* Col. Walker's Map still maintains a distinction between the towns of Chitral and Kashkar, placing the latter (across the river) intermediate between the stations (9 and 10) Kila Durum and Kis. The identification in the text of the two names is not in the original as printed at Lahore, but it appears in that publication under the Kotul-i-Darah route (see further on). And the identification is confirmed by the excellent authority of Pandit Munphool, c.s.t., in the paper following these routes.—[Col. YELLS.]

ROUTE I.—FROM JELLALABAD TO YARKAND—continued.

No.	NAME OF PLACE.	Distance in koss.	REMARKS.
25	Darboud	4	A fort containing a small garrison. No habitation.
26	Kilu-Ziabeg or "Sar-i-Yashkun"	8	No habitation. Rich valley, Pasture.
27	Ab-i-garn, or "Chattihol" ..	15	No habitation. A hot spring and a lake at the foot of the Chitral Pass, which is at times closed by avalanches from the pass 2 or 3 years continuously; after which it bursts forth in a torrent which falls into and swells the River Kooner, which rises in the pass and runs about a mile to the west of the lake. It is a small stream here, and is known by the name of the pass. The boundary of Chitral ends here.
28	Pir Klar (in the Badakhshan territory)	15	Beyond the Pass which runs across the range for 11 koss, thus:—From the base near Chattebol, to the summit, a gentle gradual ascent for about 3 koss. Thence a plateau or elevated level plain about 4 koss wide, flanked by high ridges on either side through which the road lies, in length from south to north about 5 koss. The descent from the northern extremity of the plateau to the base on the other side of the range, equally gentle and sloping with the ascent. A staging place at the bottom 3 koss. The plateau which is known by the name of the "Dasht-i-Birughil" is a rich pasturage where the Badakhshani and Chitral people take large herds of cattle, sheep, goats, horses, camels, and yaks, to graze in summer. Laden camels and horses pass through the "Dara" (Pass) with ease; it is also practicable for laden carts. It is closed by snow for 3 months—December, January, and February.
29	Sarhadd Wakhan	6	In a plain open country. The River Oxus, called here "Darya Panj," is crossed on the road. It is here fordable throughout the year. "Sarhadd Wakhan" is a town containing about 1000 houses.
	Bank of Absher stream	10	No habitation. At the foot of an isolated range of the Pamir Mountains.

ROUTE 1.—FROM JILALABAD TO YARKAND—*continued*.

No.	NAMES OF PLACES.	Distance in miles.	REMARKS.
			The Abhor stream, which rises in these mountains, joins near this point the Oxus. Road in the valley of the Oxus, along the right bank of the river.
30	Langar Sirak-Chopan	6	Road as above. Much snow falls during winter, but the road is never closed. Water, grass, and fuel in abundance.
31	Dash-i-Mirza Murad (in Pamir Khurd subject to the Babashbeg of Sir-i-kul or Tashkurghan)	6	Road in plain level country. Pamir Steppe. Full of verdure.
32	Karawan bafasi ..	5	Pamir Steppe. Full of verdure. 2 roads separate here to Tashkurghan; one to the right by Karunchunkar Pass, the other to the left through Pamir Khurd, which is shorter and easier, and as follows.
33	Chakniaklig ..	10	In Pamir Steppe. Road good. No habitation. Grass, water, and fuel plenty.
34	Aktash	10	As above. Several springs of water. A road to Kashghar branches off at this point due north. It is followed by caravans bound to Kashghar.
35	Foot of "Barzash" Pass or Dara Sir-i-kul	10	As above.
36	Nizatsah	10	Beyond the pass. Easy ascent and descent; passable for laden yabooks and camels. No habitation.
37	Jangalak	10	The road lies along a stream (Ab-i-Barzash) in a valley full of vegetation, water, and fuel.
38	Tsunif	10	Large place; containing more than 100 houses.
	Tashkurghan ..	1	The capital of Sir-i-kul, or Tashkurghan, held by Babashbeg, who is nominally subject to the Yarkand Arbān.

ROUTE 1.—FROM JELLALABAD TO YARKAND—*continued.*

No.	NAMES OF PLACES.	Distance in koss.	REMARKS.
39 40	Dasht-i-Safarikho Aghil (in Tashkurghan territory)	12	In a plain. No habitation. Water, grass, fuel, in abundance. Road good. A cattle-shed at the foot of Yambulak and Chachiklik Pass.
41	Dahn-i-tangitar, beyond the pass, a halting-place on the bank of a small stream. "Tangitar" (Ditto.)	15	The Pass which commences at Aghil and ends at Dahn-i-tangitar is about 4 koss wide, with vegetation, and has a gentle ascent and descent. The road winds along the stream which rises in the Chachiklik mountain. In the pass. Little or no snow falls in winter. Never closed. No habitation.
42	Pasrabat (in Tashkurghan territory)	5	A village containing about 200 houses of pastoral Kirghiz in a rich fertile valley.
43	Tughan in (Yarkand territory)	15	Road lies along the Charling stream (which is fordable all the year round) as far as Kaiz Aghzi. No. 44. "Tughan" is inhabited by pastoral Kirghiz. An insulated mound or ridge, covered with grass, called the "Chihil gumbaz" (a dome containing 40 tombs), is crossed on the road, 8 koss from Pasrabat.
44	Kaiz Aghzi at the foot of the Tik-i-Saghrik Pass	15	The valley ends here. At the confluence of 2 streams, the "Kiziltagh" and the "Charling," which, flowing in a south-east direction for about 10 koss, fall into the Yarkand River.
45	Yulbashi (a spring of water)	15	Beyond the Tik-i-Saghrik Pass (a low range of hills where little or no snow falls in winter) which extends for about a mile. It is rather a difficult pass, with steep ascent and descent; not practicable for laden animals except the yâk. Yulbashi (habitation of Nomad Kirghizes) lies in the Dasht-i-Shaitangum, a large barren desert containing greenish sand and hard gravelly soil commencing at the foot of the Tik-i-Saghrik range, and running for about 40 miles in the direction of Yarkand (N.E.) to within a short distance of

ROUTE 1.—FROM JELLALABAD TO YARKAND—*continued.*

No.	NAMES OF PLACES.	DISTANCE in KOSS.	REMARKS.
			Yakrik. Following stage there is no habitation, and no water on the road except at Yulbashi. Travellers carry water with them in a water-bag made of yak-skin by the Kirghiz.
46	Yakrik, on a canal cut from the River Yarkand	20	Road through the desert to nearly a koss of Yakrik, a large village which has about 500 houses inhabited by Yarkandis. On the road there is a halting-place where travellers put up under a tree.
47	Khojerik	12	A village, containing about 200 houses of Yarkandis, in the plain. Road along a canal.
48	Yarkand	12	City of that name. Road along the Urpi canal.
	Total estimated distance in koss ..	450	

NOTES.—The road from Jellalabad to Chittibol, at the foot of the Chitral Pass, lies in the valley of the Kooner River along the left bank of the river. The valley is well cultivated and thickly populated.

The Chitral Pass is perhaps the easiest of all the passes over the Karakoram and Hindu Kush ranges that lead from Ladakh, Kunjut, Iskardo, Chitral, &c., into Eastern Turkestan and Badakhshan.

There is no habitation between No. 31, Dasht-i-Mirsh Murad, to No. 38, Tienif. Travellers take provisions on the journey from Sarhadd-i-Wakhan, No. 29.

The Shaïtan-i-gum desert is another uninhabited tract. Travellers carry provisions from Tughan (43) or Kaiz-Aghzi (44).

The route is open throughout the year, except for 2 or 3 months (December, January, and February), when the Chitral Pass is closed by the snow.

ROUTE 2.—FROM CHITRAL INTO BADAKHSHAN, over the "KOTAL-I-DARRAH" Pass.

No.	NAMES OF PLACES.	Distance in kos.	REMARKS.
1	From "Darin" (stage 14, on left bank of Kooner River) to Chitral	1½	Across River Kooner. The "Kashkar" of the map, and capital of the Chitral territory. Containing about 1000 houses, and a market called "Doh-i-Bazar."
2	Chingur	4	Village of about 500 houses at the junction of Kooner and Singhur rivers. This is the place of Murfat Khan, son of one of the Chitral chiefs.
3	Singhur	10	Road along the left bank of the Singhur River. Three streams join here. 1. "Lutka," rising in the Darrah Pass. 2. "Arkari," rising in the Hindu Kush range. 3. "Khuzara," rising at the foot of the Tirichmir peak of the Hindu Kush range, covered with perpetual snow; and the stream, thenceforward called "Singhur," falls into the Kooner River at Chingur as above stated.
4	Mogh	10	Road along the "Lutka" stream. Village in a valley.
5	Andarti	10	Village in a valley.
6	Lutka	12	A large village on both banks of "Lutka" stream.
7	Shah-i-Salim ..	12	Village. A hot spring in a rich pasture ground.
8	Summit of the "Kotal-i-Darrah" Pass	3	This is the easiest of all the passes leading into Badakhshan (except No. 1, the Chitral or Bughill Pass); passable to laden horses, and closed only in the depth of winter by snow. The ascent and descent are gradual, the former extends to about 3 kos, and the latter to about 5 kos.
9	Foot of Pass on the Badakhshan side	5	A halting-place in a wide rich valley, where there is a sulphur mine.

ROUTE 2.—FROM CHITRAL INTO BADAKHSHAN—*continued*.

No.	NAME OF PLACE.	Distance in koss.	REMARKS.
10	Gogardasht	5	Road along the Gogardasht stream, which rising in the "Kotal-i-Darah" Pass, joins the Vardoj River (a tributary of the Oxus) at Gaokhana* on the road from Koondooz to Yarkand.
11	Sanglik	10	Village in the Gogardasht valley, which narrows here.
12	Iskital	5	A village containing about 200 houses; in valley.
13	Zebak*	10	Small town with a fort; in a wide valley.
	The road here joins the Badakhshan route to Yarkand.		

NOTE.—This route by the Darah Pass is the most frequented of all the routes leading from Chitral into Badakhshan, and is used by travellers and caravans. The great bulk of the trade between the two countries is carried on by this route. The road in the vicinity of the Darah-kotal is subject to the depredations of the Siab-poh Kafirs whose country here borders on the Chitral territory.

There is also a pass leading from Chitral into Wakhan, called the "Satishtirak Kotal." The road over this pass branches off the main route up the Chitral valley at "Buni," stage No. 19. It joins the road from Koondooz to Yarkand at Satishtirak, in Wakhan,† and is 83 koss from "Buni." It is a very difficult pass, and is not used by caravans or laden animals.

GENERAL REMARKS ON THE FOREGOING ROUTES.

As these routes are taken from verbal information supplied to the Punjab Government by a Yarkand merchant, I believe they are to be relied on, in so far as the general description of the roads and countries is given; but the distances are not reliable, nor can the accompanying rough map be considered as speaking geographically. If, as is stated, the pass at the head of the Chitral valley is so easy that *laden carts* can traverse it, this route must then be considered as not only the most direct road from Peshawar to Yarkand (and Badakhshan), but also as the easiest for trading purposes.

Pundit Munphool, however, states "that the trade through Chitral is confined to certain adventurous Afghans alone; and that natives of Yarkand seldom traverse this route."

The road being subject also to incursions of the Kafiristan tribes, is perhaps on that account avoided by the Yarkand merchants, who prefer the longer route via Kashgar, Khokand, Bokhara, and through Afghanistan, or through Ladakh and Kashmir.

* Gaokhana and Zebak appear in the Journal and Map of Captain John Wood, [Col. YULE.]

† The Ishtirak of Captain Wood's Oxus journey.—[Col. YULE.]

In conversation with a Moonahce—by name Mahomed Hussain (and who accompanied Pundit Munphool to Badakhshan)—I learn that the Chitral valley is well cultivated, great quantities of rice and Indian corn are grown, and it is thickly inhabited: the Khan of Chitral also professes favourable views towards the Indian Government. He, however, carries on an extensive slave-trade with Badakhshan. The Shaposh Kafirs of Kafiristan, kidnapped or forcibly seized from the adjacent country of Kafiristan by him, also persons of the Kalaah, Dangiri, and Bashghali tribes, idolaters living in the Chitral territory, as well as from the Sheeah sects, who are convicted of any crime, and the children of culprits from these classes, are sold by the Chitral ruler to the Badakhshis, Wakhs (of Wakhan), and Shighnis (of Shighuan), by whom they are taken to Bokhara and Eastern Turkestan. The price of slaves in Chitral varies from 25 tillas (about 15*l.*) to 12 tillas (about 7*l.*)

2.—*On Gilgit and Chitral.* By MUNPHOOL MEER MOONSHIEH, C.S.I., of the Punjab Secretariat.

[Communicated by the India Office.]

GILGIT is a small mountainous country, traversed by a river of that name, and lying to the south of the Karakoram or Trans-Hibetan range, on the right bank of the Indus. It is about 100 miles long from north to south, with a mean breadth of 26 miles. Its area is therefore about 2500 square miles.*

The Gilgit River is one of the principal mountain-feeders of the Indus. Its upper course is formed of two principal branches, the Yasin and Parasot rivers. The former rises in north latitude 37° and east longitude 73°, at a point where the Karakoram merges into the Hindu-kush. The source of the Parasot is in 38° 10' north latitude and 72° 40' east longitude, on the eastern face of the range which gives rise to the Chitral or Kunar River. After a separate course of 75 miles each, the two streams join above Roshan in latitude 38° 20' and longitude 73° 30', and take an easterly course for 25 miles to Gaskuch, where they are joined by the Chatarkun River from the north. Thence to the town of Gilgit its course is *s.e.* for 50 miles, below which it receives the joint tribute of the Hunza-Nagri rivers. It continues the same course for about 30 miles further to its junction with the Indus, below the defile of Makpon-i-Shang-Rong. The general direction of the stream is to the *s.e.*, and its whole length not less than 180 miles.

The valleys in Gilgit are:—Gilgit in the south and south-west, Chaprot in the north, Bakrot in the east, and Sai and Gor in the south-east, &c. And the forts or walled habitations:—in the north, Barr, Bodius, Chaprot, Chalat, and Nummal, along the right bank of the Hunza River; in the north-west, Bargu, Shakerot, and Sherot. In the Gilgit valley, the largest in the country, in the direction of Payal and Yasin; in the south, Gilgit, Danyur, Naupur, Shakwar, and Manor; in the south-east, Nanrot, Chakarkot, Jagota, Domat, Sai, and Gor; in the east, Samagarh, Bakrot, Hamusal, Zia, &c.

The people of Gilgit are Shia Mussulmans, and the whole country is now supposed to contain not more than 1000 houses.

Its produce in grain and fruits, viz., rice, barley, apples, pomegranates, apricots, walnuts, peaches, figs, and grapes, barely suffices for home consumption.

Gilgit is 22 marches distant from Kashmir, the road between the two places lying in a north-westerly direction, through Hasura and Bunji, old dependencies of Kashmir; 8 from Yasin; 4 from Gaskuch, chief place in

* Cunningham's 'Ladakh,' p. 38.

Payal, an old dependency of Yasin; 22 from Kashkaro (capital of Lower Chitral); and 6 from Daril.

Hunza (also called Kunjut) and Nagri, two small Shia districts adjoining Gilgit in the north and north-east, and lying along the opposite banks of the Hunza River, are ruled by two different Chiefs, Rajas Ghaznafar and Zahid Jafar, at variance with each other, who, as the following narrative will show, are closely mixed up with the question of the Gilgit frontier. Hunza is supposed to contain 1500 houses, and Nagri about 4000 :—

The country of Chitral divided into upper (bala) and lower (payan), and held by two different branches of an ancient family of rulers, is bounded on the north and north-west by the Hindu-kush range (continuation of the Trans-Hibetan or Karakoram range), which divides it from the Pamir Steppes in the north, and the Wakhan, Zebak, and Sanglick districts of Badakhshan in the north-west; west and south-west by Kafiristan; south by the Pranahi (Laspur) range of mountains; † east by Gilgit and the wild independent tracts of mountainous country, known by the provincial names of Shanaki and Kobistan; the former (Shanaki) comprising the districts of Hodar, Dodashal, Gilrial, Daril, Tangir, Kohli, Palas, &c., inhabited by different tribes of Dards speaking the Dard dialect, and the latter (Kobistan), a part of Yaghistan, contains the districts of Khundeyah, Guryal, Kothoin, Halail, Dabair, Samangyal, Munji, Bandkhar, &c., peopled by Afghans, who speak the Pushto.

The valley of Chitral, running in a south-westerly direction through the whole length of the country (upper and lower included), and into which numerous smaller valleys and defiles open out, is traversed throughout by a river called Chitral, after the name of the country, and Kunar, from the circumstance of its joining the Kunar, or Karna River, at Chaghan Sarai, a place in Kunar, whence the united stream falls into the Landa or Kabul River at Jalalabad, 3 marches below.

The Chitral River takes its rise from a lake called Chittiboi, at the foot of the Chitral Pass, over the Karakoram, or Trans-Hibetan range, between Chitral and the Pamir Steppes. This lake is sometimes closed with avalanches from the pass.

Chitral-bala lies along the upper course of the river, and Chitral-payan on the lower.

The chief places in the former are—Mistuch, Yasin, seats of divisional governments, Chitarkun, Payal, Gaokoch, Varahgun; and in the latter, Chitral or Kashkaro, Suget, Baroz, Drus, &c.

The population consists of Mussulmans, both Sunni and Shia, and Kafirs. The Sunnis inhabit the southern portion of the country, and the Shias the northern and north-western tracts, adjoining the Shia districts of Wakhan, Zebak and Sanglick in Badakhshan, and Gilgit, &c. The Kafirs are confined to a tract bordering on Kafiristan, to which it formerly belonged, now under Chitral-payan.

The rulers, professing Sunnism, have ever since the introduction of Islamism into Central Asia,* been carrying on the singularly horrid practice of selling their own subjects into slavery. Following a doctrine of their own creation, that the "Sharah" (Mohammadan law) permits the Sunni to make slaves of Kafirs (unbelievers), amongst whom they include the Shias,† they have

* The two districts (Hunza and Nagri) have an area of 1672 square miles.—Cunningham's *Ladakh*, p. 33.

† The *Laspur* Mountains of Col. Walker's Map.—[Col. YULE].

** † The Shia, though professing Islam, is looked upon by the Sunni in the light of a Kafir, and termed "Rafizi" (heretic). Throughout Turkistan (Bukhara in particular) Shias are not tolerated. Whilst there, they are consequently obliged to hide their belief, and conduct themselves in all outward forms of religion, as well as social intercourse, like Sunnis.

been in the habit of capturing their Shia and Kafir subjects, as well as Sikh-pesh Kafirs and others kidnapped or forcibly brought away from the adjacent countries of Kafiristan, Gilgit, &c., and selling them into slavery to slave-dealers from Badakhshan, Kunduz, Turkistan, Balkh, Bukhara, and Afghania, &c., receiving their price in cash and goods. Criminal and political offences amongst the Shia and Kafir subjects of Chitral are, as a general rule, punished by enslavement of the offenders themselves, their children, or other grown-up relations. Sometimes whole families are sold away in groups. The Sunni population, professing the same faith as their rulers, and protected by the Sharah, are free from all such servile bondage and transfer.

The slave forms one of the principal items of revenue of the Chitral rulers. The annual tribute which they pay to the Chief of Badakhshan, to whom they owe a sort of allegiance, is made in slaves.

The Chitral slave girls and boys are the most prized of all the different descriptions of slaves brought to the Turkistan market, excepting, perhaps, the Irani (Persian) for their superior beauty,* docility, and fidelity. The Chitrali, perhaps, is equally faithful with his brother slave of Africa, the negro (Habashi—Abyssinian), whose devoted attachment to his master is proverbial in the East. The Kafirs, distinguished by their whiter skins, redder complexion, blue eyes, light hair, and robust form, are the most untractable and revengeful of all the other descriptions of slaves in Central Asia.

Combining great physical strength with desperate courage, inured to chase and war, from the nature of their country, their social habits and institutions, and the constitution of their government, which is purely patriarchal, divided into numerous patriarchies, split by hereditary feuds into factions, the Kafirs have not only successfully repulsed the occasional predatory incursions of their Mussulman neighbours, the Afghans, the Chitralis and the Badakhshis, but constantly retaliated by making raids on all the tracts bordering on their own. These marauding excursions have, of late years, ceased in the direction of Badakhshan and Chitral, since the establishment of friendly relations between the border Kafirs and the rulers of those countries, but the former still continue to infest and plunder the caravan-routes in the vicinity, and over the mountain passes of Durrah and Lahauri.†

The mutual dissensions amongst the Kafirs drove the Kafir tribes, now under Badakhshan and Chitral-payan, to submit to foreign yokes.

Death is the only punishment the Kafirs inflict on their Mussulman captives. All Kafir slaves who manage to escape back to their native country (Kafiristan Proper) are allowed to revert to their faith and social rights and privileges by their brethren.

The price of slaves throughout Turkistan generally varies from 500 to 100 Muhammad Shahi Rupees.‡ It is generally paid partly in cash and partly in goods, and rarely wholly in cash.

The Chitralis speak a peculiar dialect called Chitrali; the mercantile and the higher classes speak Persian also.

The town of Chitral, called Kashkaro, or Kashkar by the Afghans, capital

* The Chitralis bear a strong resemblance in their physiognomy, features, and colour, to the hill-people of Chamba and Kangra. Their beauty consists in symmetry of form, black eyes, and hair. The Skins shave their beards and wear short hair like natives of India.

† The easiest, and consequently the most frequented, passes on the caravan-route from Peshawar to Badakhshan. The former (Durrah) lies over the Hindukash range, between Chitral and Badakhshan, and the latter (Lahauri) between Yaghistan and Chitral.

‡ A Muhammad Shahi Rupee is equal to 1 rupee and 3 annas of English money at Peshawar.

of Chitral-payan, is the chief place of commerce in the country. It is situated on the two caravan-routes between India, Badakhshan, and Yarkand, which, if carried for, can be made to connect more closely the north-western frontier of India with Western Turkistan through Badakhshan, and Eastern Turkistan through the Pamir Steppes, by the shortest, the directest, and perhaps the easiest of all the lines of communication now in use. The only dangerous portion of the route is the country of Yaghistan (Bajour and Swat, including Dir), between Peshawar and Chitral.

Caravans of petty merchants now pass through Kashkaro annually between Peshawar, Yaghistan and Afghanistan, on the south-east and south-west, and Badakhshan, Kunduz, Balkh, Turkistan, and Kolah, a principality in Bukhara, on the north-west, and Eastern Turkistan on the north-east.

Mistuch and Yasin, in Chitral-hala, are also resorted to by traders for the purchase of slaves. The former lies on the caravan-route leading to Yarkand, 7 marches up the Chitral River from Kashkaro; the latter, lying between Mistuch and Gilgit, is about 15 marches from Kashkaro, and 6 or 7 from Mistuch.

Trade in Chitral is chiefly carried on by means of barter ("marchah"). The Peshawaris, the Afghanistanis, and the Yaghistanis, both Hindu and Mussulman, exchange Bahadarkhel salt,* English and Indian piece-goods, grocery, haberdashery, Bajour iron, for Hartal (orpiment), Chitral woollens (blankets and choghas) and falcons. The merchants from the north-west bring horses, Bukhara and Khokand silks, cloaks of Russian broad-cloth, and Badakhshan salt,† cotton cloth, and degchans (iron cans, cast after the Russian style), &c., for the purchase of slaves and Chitral woollens (cloaks, blankets, and stockings). The trade between Yarkand and India, or Afghanistan, through Chitral, is confined to certain adventurous Afghans only; natives of Yarkand seldom or never take this route.

Chitral, as already stated, is held by two different branches of an ancient family, descended from a common ancestor, "Kathor." The branch in possession of Chitral-hala is called the "Khushwaktin," from Khushwakt, an ancestor of the present incumbents; that holding Chitral-payan goes by the name of the "Shahkathoria," after Shah Kathor, grandfather of the present ruler, Aman-al-mulk. The two branches not only rule over their respective countries independently of each other, but are generally at variance with one another.

3. *Peruvian Exploration of the River Ucayali.*

[Communicated by I. GERSTENBERG, Esq., F.R.G.S.]

D. JUAN R. TUCKER, President of the Hydrographic Commission sent in the time of Colonel Pado's government to the Amazon with the object of exploring each of the tributary rivers of that region, has sent a communication to the Government, dated November 16, in which he gives an account of the result of his labours. The last exploring expedition has had for its object to seek a passage to Chunchamayo, ascending all the river Ucayali through regions entirely unknown. The small steamer *Napo* of little force, the only one of which the commission could dispose, started from the port of Iquitos the 4th of last September, and navigating all the Ucayali from its confluence with the Marañon up to its formation by the Tambo and the Urubamba, 712 miles, first ascended the Tambo, and later on the Urubamba; but had to return from thence, its machinery not being sufficiently powerful to overcome

* In the Kohat district of the Punjab.

† From the mines of Kalaogin in Muehhad and in Farskhar, both districts of Badakhshan.

the powerful current; 5 miles being the greatest distance which it was able to ascend the Tambo (60 miles from the fort of Chanchamayo) and 35 miles the Urubamba. The Ucayali has a course of 772 miles in this order:—

From its mouth to the town of Sarayacu	Miles 269
From Sarayacu to the mouth of River Pachitea, a tributary of the Ucayali	306
From the mouth of the Pachitea to that of the Tambo	197
	<hr/> 772

The steamer *Napo* has ascended by the Urubamba 35 miles higher than the mouth of the Tambo; and if this last point be compared with that which the city of Cuzco occupies, it will be found that the distance in a straight line is but 65 leagues.

This expedition confirms the tidings which other explorers had given us of the great Ucayali, with respect to the facility with which it can be navigated in any season by larger vessels, as well as—what is now beyond doubt—that the Ucayali is the true source of the Amazon, and not the Marañon as was formerly supposed.

It is almost impossible to determine the number of Indians that inhabit these regions, but it is supposed that it must be very large from the great traffic that is observed in navigating the river.

The principal articles of commerce of the lower Ucayali are, salt fish, land and river turtle, oil of copaliba, and gums: the temperature is very mild and agreeable.

The expedition has been unable to ascend the Tambo, on account of the incapability of the steamer, that is to say [at least Mr. Tucker asserts so] with another better adapted, the approach to Chanchamayo will be effected, and thus the great problem will be resolved, of the possible navigation of our rivers to the foot of our Eastern cities.

4. *Journey through the Gold Country of South Africa.* By J. FENWICK WILKINSON, Esq.

On the 7th May, 1866, I left Merico, Trans Vaal Republic, with the intention of exploring and hunting the Mashoona country, north-east of Moselikatse. We reached the chief Sekomo's in one month; and found plenty of water and grass. We went by the way of the Notwani, a tributary of the Limpopo. There are three roads leading to Sekomo's (now Machin's) from Merico: one by the Limpopo, one by the Notwani, and one by the chief Sechele. By the latter there are about two days and a half of deep sand to track through, with a scarcity of water; this was the road used by Mr. Baldwin. By the Limpopo, you have nearly one day of sand, after leaving the river, and in the winter—the dry season—you may not find a drop of water from the time you leave the river till you get to Machin's, three and a half days' track. By the Notwani you have only about two hours of sand, generally speaking plenty of water, and a better road. There is very little difference in the distance. The bush-country begins at Merico. There is abundance of firewood, &c. The camel-thorn abounds, and, the further north you go, the more timber you find.

The country, after reaching the Notwani and Limpopo, is nearly flat in places; in other parts gentle undulations. Giraffes, buffaloes, elands, koodoo, pallah, lions, &c., abound. We remained about five days at Sekomo's, during which time he was deposed, and Machin raised to the throne. The principal part of the ceremony at the coronation consisted, I believe, in their

killing an ox, and Sekomo smearing Machin's hand with some of the dung! Sekomo was opposed to education and civilisation; subsequently he left the country, as his sons supported Machin, who favours education, and is, I believe, a Christian. Two days after leaving Machin's, on the road to Moselikatse, you have about a day and a half without water; that is, in the dry season. The tsetse (fly) is near on the right-hand side, but not on the path. You then have sufficient water all the way to the river Ramahquaban. Ramahquaban is about nine days' track by ox-wagon from Machin's.

We arrived there in June, and found the bed of the river dry; it is about 100 yards broad. We got plenty of water for our oxen in a pool close to the drift or ford, between some large granite boulders. We almost emptied the hole, but it soon filled again, the water percolating through the sand. All the rivers had sandy beds, and we saw numerous holes with water in them, made by the elephant, buffalo, rhinoceros, &c.

Ramahquaban is about 21° s. lat., and crossed by the meridian of 29° e. long. From here to Moselikatse there is a good road; indeed right through the Mattabuli country, with abundance of grass, bush, timber, and running streams summer and winter. As the great chief Moselikatse is frequently changing his place of residence, it is difficult to say how far he may be from Ramahquaban; but nine or ten days from Ramahquaban will generally reach him. We killed seven or eight elephants on our way up, besides other large game, such as giraffes, elands, &c.

We found the chief in moderate health; he is 74 years of age, but paralytic, and unable to move himself. He sits in an arm-chair outside his hut, the greater part of the day, drinking Kafir beer, surrounded by some of his wives (he is reported to have 600) and captains. He is always glad to see Englishmen. It is supposed that he could, if pressed, muster an army of 50,000 men. From him we obtained leave to penetrate the Mashoona country, which we did to $16^{\circ} 30'$ (or thereabouts) s. lat., 30° e. long.

We found a most beautiful country, undulating, full of running streams, and some fine rivers, and in the deep reaches of which were hippopotami and crocodiles. We were one month reaching the river "Swaiswa;" it runs north-west, as indeed did all the rivers in that country, as far as we saw. As we got far north, we lost the thorn-bushes; but the country is well wooded, with what appeared to me a sort of acacia with very long leaves, but I am no botanist.

The beds of the rivers were covered with agates, calcedony, crystals, &c. We made a stay of two to three weeks on the banks of the Swaiswa, hunting elephants, &c. We then crossed the river and tracked through a remarkably rich country to "Fole," another large river laid down in Dr. Livingstone's map. Fole is about a day to a day and a half from Swaiswa. We found no difficulty in travelling through the country with our waggons. We generally followed some Kafir path; and in the heart of the Mashoona country came to water nearly every half-hour on the average.

We halted about three weeks on the south bank of the "Fole," and left our waggons for three or four days at a time to hunt elephants. We penetrated about 35 miles further north on horseback, till we must have been in the lat. of Tete, but some 120 miles to the westward of it. We saw three or four Mashoona one day, but they ran away. They were once a numerous and powerful tribe, but the Zulus under Moselekatee have almost exterminated them. This country is nearly literally "without inhabitants."

We passed by many ruined towns and villages. Their huts are similar to those further south, that is, mud walls four feet high, round, and a roof of grass. We rode over several gardens, and rice, Indian corn, and millet grounds. The Mashoona are great agriculturists; we observed some new kind of earth-nuts, and a root somewhat resembling a sweet potato, but not so large. They

cultivate rice in round holes about a yard in diameter; they then let the water in when they please. On one occasion, on an afternoon, we saw a native, he ran for his life; our guides (from Moselikatse) chased him. We cantered after them; the chase took us to a natural fortification of immense granite rocks, 30 and 40 feet high, enclosing an area of about 50 yards in diameter. Where the rocks did not meet, the natives had built a wall 6 feet thick by 10 high. There were two entrances. We found a party of some 20 men sitting round a fire in a most dejected and resigned state. Moselikatse had attacked the same people a short time previously, and committed awful slaughter; these poor creatures thought that he had now sent mounted white men to finish them. They were astonished when we asked them kindly if they would sell us some rice and Indian corn, and when we paid them double the value they were still more surprised and delighted; they had never seen white men nor horses before. As we rode into the enclosure they never touched a weapon, their assegais, bows, and arrows were by their side. They had one large hut between the rocks; we had to ascend a rude ladder to see it; we did not go down and enter it, as the women and children were greatly alarmed. We passed the night in the Mashoona fortress; and some of the young men accompanied us next day, to carry our guns and assist us to find elephants. Two or three of the men had highly-finished knives, the blades were about 10 to 12 inches long, the handle 4 inches; the wooden sheaths were well carved, and ornamented with copper wire. We offered a great price for them, but nothing would induce them to part with one.

The richest gold-fields, discovered in 1867 by Herr Carl Mauch, are in this district, only a little further to the westward down the Swaiswa and Fole. He informed me that the goldfield reached with 50 miles of the Zambesi. I did not go up the country that year.

Of course the best route to those goldfields is the Zambesi, and *not* Natal. From Natal you have a journey of three months, involving great expense, labour, and hardships. On our return to Fole from our Mashoona friends we found no waggons, but a notice stuck on a tree, to inform us the tsetse fly had been seen the evening before, and that they had inspanned, and retreated some six miles. Resting here for two or three days we inspanned, and with a Mashoona for our guide struck off through the Veld to the eastward; the second day we outspanned on the banks of a small stream, the sides of which were covered with agates, calcedony, and crystals. I found here a piece of calcedony about the size of my fist, in a hollow was a beautiful cluster of five gems. I also discovered some fossil bones, one portion had crystals on it. Some five miles to the eastward was a range of mountains running north and south. The rivers Fole, Swaiswa, Umyati, and others rushed through these mountains to the s.w., but we were evidently close to the watershed of this part of South Africa, as the streams were very small. We saw a great deal of elephant-spor, but did not meet with many elephants. Lions abound. The mountains were, I might say, made of iron, the ore was so rich. On riding to the top we perceived another range of mountains, about 40 miles further to the eastward also running s. and s.-; the country between was rich and beautiful in the extreme, and, as I thought, resembled rich English scenery in a grass county. An undulating country full of rivers and brooks, fields, trees in hedge-rows, woods and parks.

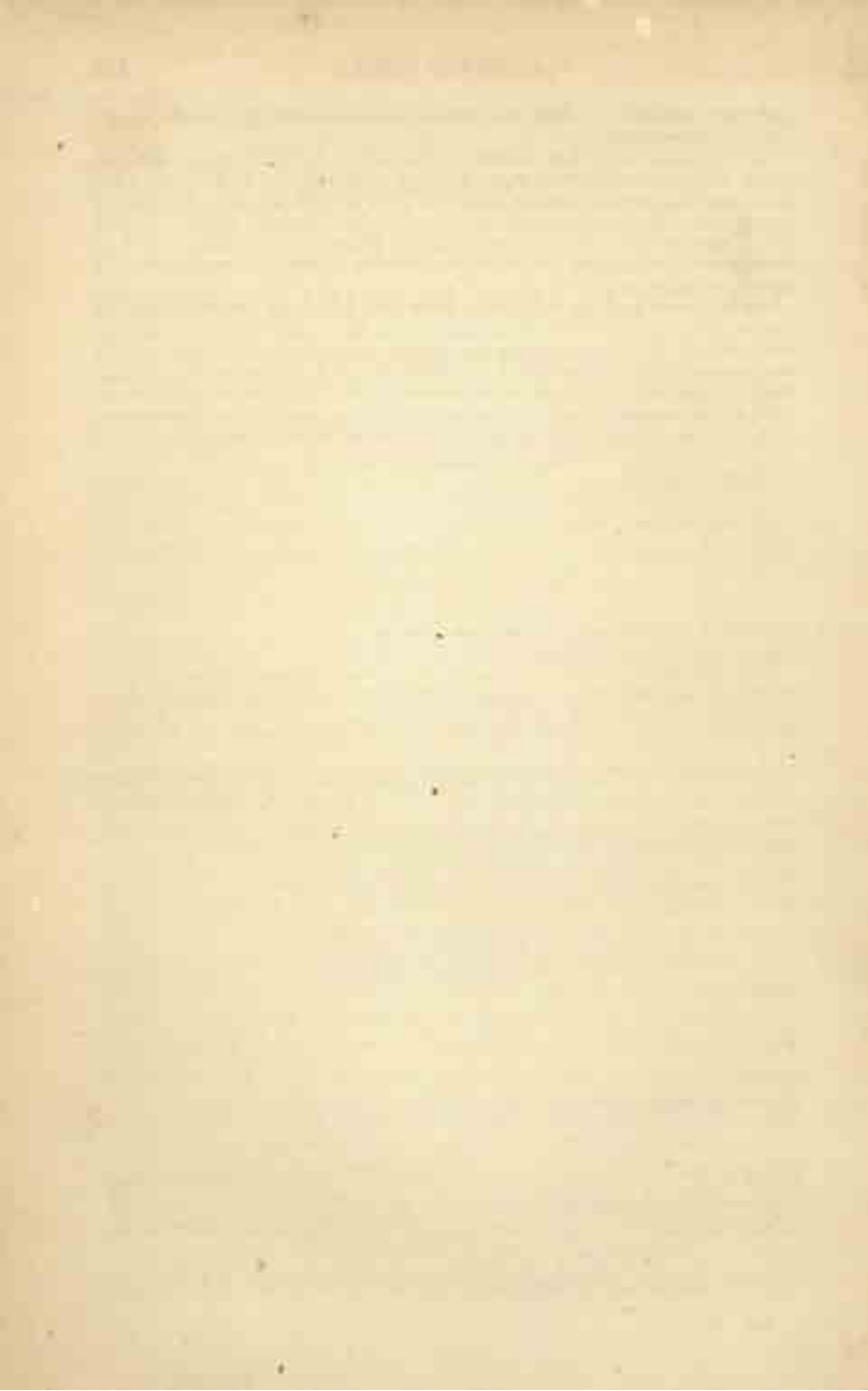
Our Mashoona guide was much interested in the waggons, he thought the wheels turning round an excellent idea. At this place he was the only native who came near us—the others fled. Two to three hundred of them surrounded us one dark night as we sat round our fire; they thought we were half-caste Portuguese traders; their intention was to spear us, and were just in the act of lifting their assegais when they recognised Inyoka, our guide from Moselikatse; they then knew that we must be the white hunters they had heard of, but

had never seen before. They then retired, and we knew nothing of our escape till the following year.

We remained about three weeks on this spot, and then steering south and south-west got on to our old track, and bore away again for Moselikatse. We calculated the mountain ranges to be from 1500 to 2000 feet from the base. I might remark that, on ascending a hill at our furthest point north, I saw the small river we had halted on for the night, after running a little way s.w. bend and run nearly due north into the Zambesi. We enjoyed excellent health during the whole trip.

Mashoona country lies high, but I cannot say how high, above the level of the sea. We continued to rise gradually from Moselikatse's Kmal nearly the whole way to the mountain range. During the whole of this journey I was in company with Mr. James Gifford, who took charge of the present Sir Richard Glyn's waggons in his trip to the Zambesi in 1863. In computing distance by time by ox-waggon, 18 miles a day would be a fair average, six hours a day at three miles an hour. We returned to Merico in January, 1867.

October 26, 1868.



PROCEEDINGS
OF
THE ROYAL GEOGRAPHICAL SOCIETY.

[ISSUED JULY 20TH, 1869.]

SESSION 1868-69.

Eighth Meeting, March 8, 1869.

MAJOR-GENERAL SIR ANDREW SCOTT WAUGH, R.E., F.R.S., VICE-PRESIDENT, in the Chair.

PRESENTATION.—*Dr. Alfred Barry, M.A.*

ELECTIONS.—*Ebenezer Foster, Esq.*; *Sir Henry Green, K.C.S.I.*; *William Griffiths, Esq.* (Magistrate for Middlesex); *Lieut.-Colonel Nassau Lees, D.C.L.*; *F. T. Mott, Esq.*; *Lieut.-Colonel Edward Neville.*

ACCESSIONS TO THE LIBRARY FROM FEBRUARY 22ND TO MARCH 8TH, 1869.—'Turkestan in 1866.' By P. N. Pascheno. (In Russian.) St. Petersburg, 1868. 'Il Giappone o il Viaggio della Corvetta *Magenta* nel 1868.' Per V. F. Arminjon. Genova, 1869. Donor, Il Commr. Negri Cristoforo. 'The Malay Archipelago.' By Alfred Russel Wallace. 2 vols. 1869. Donor, the author. 'The Geographical Distribution of Mammals.' By Andrew Murray. 1866. Purchased. 'A Journey to Kashgar in 1858.' By Captain Valikhano. Translated from the Russian by R. Michell. Donor, the Viceroy of India. 'Notes on the North of China.' By the Rev. A. Williamson. 1867. Donor, Sir R. L. Murchison. 'Submarine Telegraph to India and Australia.' Donor, Major Leveson. Foreign Office List for 1869. Donor, Edward Hertalet, Esq.

ACCESSIONS TO THE MAP-ROOM SINCE THE LAST MEETING OF FEBRUARY 22ND.—A large Polar Diagram of the Antarctic Regions, extending from the South Pole to the parallel of 50° S. Presented by Staff-Commander J. E. Davis, R.N. Two Diagrams, illustrating the transit of Venus over the Sun's disc for the year 1882. Presented by Staff-Commander Davis, R.N. A Pictorial Diagram of Cockburn

Island, in the Antarctic Regions. Presented by Staff-Commander Davis, U.S. A Bust of Richard Lander, Esq., the first Gold Medalist, discoverer of the course of the River Niger. Presented by Mrs. Elsom. Abyssinia, Eastern portion, showing the line of march of the Army under Lieut.-General Lord Napier of Magdala. On five sheets. Presented by Sir H. James, B.E., Director of Ordnance Survey. Admiralty Charts, 11 in number. Presented by the Lords Commissioners of the Admiralty, through the Hydrographer, Capt. G. H. Richards.

The CHAIRMAN, in announcing the subject of the paper, said, that it related to a region which had never been explored by scientific travellers, and therefore offered peculiar interest to geographers, whose motto was *terra incognita*. The region west and south-west of the Rocky Mountains was interesting in a geological point of view, and also in its ethnology. To the south of it were those peculiar people the Aztecs. The physical character of the country in some respects resembled Abyssinia and Tibet, where the rivers cut deeply into the earth and formed enormous ravines or cañons, which served as natural barriers against the extension of nomadic races.

The following Papers were read:—

1. *On the Physical Geography of the Colorado Basin and the Great Basin Region of North America.* By W. A. BELL, Junr., M.B., F.R.G.S.

THE country treated of in this paper lies between the Rocky Mountains on the east and the Sierra Nevada of California on the west, and was shown by the author to present many very remarkable topographical features. A description was first given of the Colorado Basin.

Dr. Bell joined the survey expedition dispatched by the Union Pacific Railway Company to determine the best route for a southern line of railway through New Mexico and Arizona to California. He traversed the western part of America between the 33rd and 31st parallels of latitude, recrossed the great interior plateaux farther north, and travelled through Sonora from north to south. The basin of the Colorado has an area of 200,000 square miles, and the Great Basin an area of 280,000 square miles. These basins are separated by the range of the Wahsatch Mountains, which have a breadth of 60 miles. The basin of the Colorado is of triangular shape, and consists of successive table-lands of from 4000 to 7000, or even 8000 feet in elevation, having abrupt edges and generally barren surfaces. The Green and Grand rivers passing over the table-lands have formed for themselves deep cañons. The great cañon of the Colorado has a length of 300 miles, and the sides of its gorge rise from 1000 feet to nearly a mile in perpendicular height. Last year James

White traversed this gorge on a raft of cotton-wood. Canons are formed entirely by the action of river-water. They cannot exist except where there are the following conditions: a dry climate, never-failing streams, and a slope great enough to give force to the current of water. In the case of the cañons of the Colorado Basin the surface-strata are soft, but the erosion, once begun, is carried on even through the hardest granite. Where cañons exist the tablelands above them must be barren. All the water flows away in the deep river-valleys, and tributary streams come to the chief river through tributary cañons. Central Arizona here and there has heights of volcanic origin. It is a fertile and beautiful country, abounding in pine, cotton-wood, grass, &c., rich in mineral wealth, and possessing a considerable rainfall. This last circumstance results from the fact that the Rocky Mountains proper terminate about the 35th parallel, and that the Sierra Madre of Mexico does not commence till some distance to the south-west, thus allowing the rain-laden winds from the Gulf of Mexico to penetrate to this part of the basin.

Dr. Bell traversed the cañon of the Aravaypa, a small tributary of the Colorado. The gorge has a length of 30 miles, but took six days and five nights for its passage. The travellers had to make their journey chiefly in the bed of the stream. At the entrance of the gorge was "Look-out" Mountain. The fall of the stream at first was about 50 feet in a mile; and the rocks on either side were first conglomerate, and then sandstone overlying granite. The vegetation was very dense, a perfect thicket of trees, through which progress could only be made at the rate of $2\frac{1}{2}$ to 3 miles a day. Quails, kingfishers, wild turkeys, &c., were found in abundance. After $7\frac{1}{2}$ miles the cañon narrows to the mere bed of the stream, and beyond this contracted part was found an open space, in which grew ash, willow, walnut, and other trees, and there was mistletoe in abundance. Farther on a change in the rocks took place, and volcanic rocks were seen. The great cactus (*Cereus giganteus*) was found in abundance, some of the plants rising to a height of 40 feet. Then came a second narrow gorge, and after that the sides of the cañon presented the appearance of rising in different stories. The ledges of rock represented slips of the sides of the cañon. The appearance of the camp at night was described as most picturesque. The sky seemed but a long narrow strip, brilliant with stars; the camp-fires blazed brightly, and the sounds of the camp-life were echoed from the sides of the cañon with great vividness. The cañons have proved very complete barriers against migrations from the south, and the Indians, particularly the Apaches, have set themselves to oppose

advancing civilisation as far as they can. The land becomes more and more dreary as the head of the Gulf of California is approached.

West and north-west of the Wahsatch Range lies the Great Basin, bounded westward by the Cascade Range and the Sierra Nevada, and having an average elevation of 5000 feet. Many small ranges traverse it from north to south, each range having an average width of 12 miles, and an elevation of 1000 to 4000 feet. Where it is irrigated, the soil of the Great Basin is rich and fertile; but it has many salt lakes, some of which are dried up, and have left behind salt incrustations. Earthquakes are frequent, hot springs very numerous, and mud-volcanoes are met with in some localities. The rainfall is very small in the Great Basin, and it has no one large stream. It is really a collection of small basins, the streams of which have not force enough to unite and form one large river. The lakes into which most of these streams flow have often no outlet, and are therefore salt. The Great Salt Lake is an example of these. Lake Utah, which has an outlet, is fresh. The whole of the Great Basin abounds in silver; in four years silver to the value of eleven millions of pounds sterling was sent out from this district alone.

The paper will be published entire in the 'Journal,' vol. xxxix.

THE CHAIRMAN, in returning the thanks of the meeting to Dr. Bell, said, the paper was replete with fresh knowledge respecting a country of which we previously knew scarcely anything. With the attraction of the silver ridges he had no doubt the region would soon become better known.

Dr. BELL, in answer to the questions of members, made the following remarks on the native races who inhabited the region treated of in his paper.

The country for ages had probably been inhabited by indigenous tribes of a very low type; miserable people who lived by hunting, or upon roots, snakes, reptiles, and any decayed animal matter which they could find. When the Aztec races in Southern Mexico had become numerous and powerful, they extended their little communities as far north as they could, gradually advancing until they reached Central Arizona. The Aztecs found the country peopled by these inferior tribes of red men, who, although low in the scale of humanity, were very warlike, and resisted the advance of the semi-civilised intruders. Consequently, to protect themselves against the Apaches and others, the Aztecs built curiously fortified towns on the banks of the streams, consisting each of one large dwelling from three to five and seven stories high. Zúñi, which is situated on a southern tributary of the Colorado, was one of the few towns at present inhabited by the Aztecs or Pueblo Indians. They are a very industrious people. Until the Americans came into the country they were in the habit of growing their own cotton, making their own clothes, weaving and spinning, and also making a great deal of pottery and basket-work. They worshipped Montezuma, and burned the sacred fires, showing that they had come from the south. In their progress northward they kept to the west of the Mexican Cordilleras, and extended their migrations until, about lat. 36°, they encountered the Great Canyons of the Colorado, Colorado-Chiquito, and San Juan rivers, which form by their union an impassable barrier, stretching from east to west for a distance exceeding 500 miles. These town-builders never entered the country north of the Great Cañon, and the reason

why we in England had heard so little of them is that English travellers had always passed north of their country, or else south of it in Tropical Mexico. The remains of fortified Indian towns are only found in Central Arizona, between lat. 36° and 32° , and the absence of them to the southward can only be explained by the fact that there were no Apaches there to molest the Aztec settlers. The cause of the depopulation of Central Arizona and New Mexico was this:—when the Spaniards invaded this country in the sixteenth century they found it full of people. They found the Aztecs the dominant race; and the wild Indians were so kept at bay that they were scarcely noticed by the Spaniards. They saw nothing of the wild men of the mountains; but they saw a great deal of these tame Indians, whom they enslaved, and compelled to work in their mines. After a century and a half, civil wars destroyed the power of the Spaniards; they could not keep their military establishments in proper order all over the country, and they left the enslaved people to fight for themselves. Having been so long demoralised by slavery, they were not such good warriors as they had formerly been, and the Apaches have almost cleared them off the face of the country. As the population decreased, irrigation had also ceased, and the country had become much drier. With the return of population there would probably be plenty of cultivation again in the valleys formerly occupied by the Aztecs, and the humidity of the climate would increase.

With respect to a rumour, some forty or fifty years ago, of the discovery of an Aztec city on the banks of the Colorado, he stated that Zuni, which he had before alluded to, was, no doubt, the city in question. It was the only large Aztec town at present inhabited in that locality, and consisted of six stories or lofts. It was not what we should call an ancient city, probably about three hundred years old. But there were ruins of many towns which were larger than Zuni. North of Fort Defiance there were seven villages, all built on the summit of cliffs, each admirably fitted for the purposes of defence. Each village consisted of one large house, three stories high; and each story contained thirty, forty, or a hundred rooms. Zuni was built of squared stones; at some places the houses were built of sun-dried bricks, not cemented. The mode of entrance was very peculiar. There were no apertures on the ground-floor. The first story was reached by a ladder from the outside; then there were doors opening all round into different rooms from a ledge on the second story; and also there were round holes in the floor through which they passed down into the ground-floor. When the Apaches came, they drove their stock on to the top of the flat mountains or mesa with perpendicular sides; and then they got on to the top of their houses and fought hand to hand. The early Spanish writers—particularly the great explorer Vasquez de Coronado—gave accounts of assaulting Zuni, and others of these towns, and bore testimony to the bravery with which the defenders fought. He believed that these towns were built about 150 years before the Spaniards came into the country. When the Spaniards first came, they said Zuni contained 11,000 inhabitants. At the present time there were scarcely 3000 inhabitants. The town was like one enormous house. The term Aztec gave rather an unfair idea of these races. They were not all one distinct tribe, although they fraternized together; as a number of semi-civilised races would do in waging war against wild and savage races. In different parts they differed very much. On the Rio Grande the Pueblo Indians were a small race; at Zuni they were of better size. But the largest of the semi-civilised races that he had seen was in Sonora—the Papago Indians. One day he had the opportunity of measuring five of them at a rancho, and the whole of them were over six feet three inches. With regard to distinctions of rank, the different tribes were very peculiar in that respect. Some of them were very aristocratic. There was a small colony of these Indians on the Gila called Pima; these were too aristo-

cratic to work for hire. They used to grow cotton to an immense extent; but they did not do so now, because they could buy clothing at a much cheaper rate than they could make it for themselves. But they grow three times as much corn as they required for home consumption, and they sold it at a great profit through the medium of Government agents. The Papagos, on the contrary, were fond of hiring themselves out as labourers. At certain seasons they would leave their country—which was very barren and desolate—and hire themselves out for a dollar a day. They would till the ground, work in a mine, or do anything else. Then, when the proper season came round, they would go back to their own country, and cultivate their crops. They had a regular system of government; the head-man was appointed by universal suffrage. They were quite democrats in their notions. They married only one wife: they did not work their women to the extent the wild savages did; in fact, they treated them with a certain amount of respect. He had never known a Papago, a Pima, or a Zuni Indian, beat his wife. Unfaithfulness on the part of their women was of very rare occurrence and was punished with death. They had flocks and herds in considerable numbers. Horses were scarce among them, because they could only get them from the Americans. Mules they valued very highly, and would give a high price for them—as much corn as would fetch 300 dollars.

2.—*On the Formation of Fjords, Cañons, and Benches.* By ROBERT BROWN, F.R.S.E.

1. *Fjords*.—Intersecting the sea-coast of various portions of the world, more particularly in northern latitudes, are deep, narrow, inlets of the sea, surrounded generally by high precipitous cliffs, and varying in length from two or three miles to one hundred or more, variously known as, “inlets,” “canals,” “fjords,” and even on the western shores of Scotland as “lochs.” The nature of these inlets is everywhere identical, even though existing in widely distant parts of the world, so much so as to suggest a common origin. On the extreme north-west coast of America they intersect the sea-line of British Columbia to a depth in some cases of upwards of a hundred miles, the soundings in them showing a great depth of water, high precipitous walls on either side, and generally with a valley towards the head. On the eastern shore of the opposite island of Vancouver no such inlets are found, but on the western coast of the same island they are again found in perfection, showing that in all probability Vancouver Island was isolated from the mainland by some throe of nature prior to the formation of the present “canals” on the British Columbia shore, but that the present inlets on the western shore of Vancouver Island formed at a former period the seaboard termination of the mainland, and were dug out under conditions identical with those which subsequently formed the fjords now intersecting the coast.

Jervia Inlet may be taken as the type of nearly all of these inlets

here as well as in other portions of the world. It extends in a northerly direction for more than 40 miles, while its width rarely exceeds $1\frac{1}{2}$ mile, and in some places is even less. It is hemmed in on all sides by mountains of the most rugged and stupendous character, rising from its almost perpendicular shores to a height of from 5000 to 6000 feet. The hardy pine, where no other tree can find soil to sustain life, holds but a feeble and uncertain tenure here, and it is not uncommon to see whole mountain-sides denuded by the blasts of winter or the still more certain destruction of the avalanche which accompanies the thaw of summer. Strikingly grand and magnificent, there is a solemnity in the silence and utter desolation which prevails here during the months of winter—not a native, not a living thing to disturb the solitude; and though in the summer a few miserable Indians may occasionally be met with, and the reverberating echoes of a hundred cataracts disturb the silence, yet the desolation remains and seems inseparable from a scene nature never intended as the abode of man. The depths below almost rival the heights of the mountain summit: bottom is rarely reached under 200 fathoms even close to the shore.* The deep inlets on the Norwegian coast, known as *fjords*, a familiar name now applied generally to such breaks in the coast-line, are too well known to require description. On the coast of Greenland are again found similar sounds, indenting both sides of that island (?), but more particularly the western or Davis Strait shore. Most of these inlets are thickly studded with floating icebergs, and others are so densely choked with them as to receive the names of ice-fjords. All of these fjords form the highways by which the icebergs float out from the glaciers at their heads, whenever these prolongations of the great *Mer de Glace* of Greenland (the "inlands is") reach the sea. After a long and careful study of these fjords in most parts of the world where they are found, I have come to the conclusion that we must look upon glaciers as the material which hollowed them in such a uniform manner. Everywhere you see marks on the sides of the British Columbian fjords of ice-action, and there seems no reason to doubt but that they were at one time the beds of ancient glaciers, which grinding their outward course to the sea scooped out these inlets of this great and uniform depth. At this present day, not far from the head of most of these inlets, glaciers are found in the Coast range and Cascade Mountains, and along both ranges marks of old glacier-action can be seen 2000 to 3000 feet below their summits, and even near the sea-margin. Such

* "Vancouver Island Pilot," p. 129. Richards.

a depression of the coast, with the presence of the lower temperature then prevailing, would fill these fjords with glaciers. I may add that though Prof. Whitney,* on the most hearsay evidence, seems inclined to think that the northern drift is not found over Vancouver Island and British Columbia, it certainly exists in a well developed condition.

2. CAÑONS.—This convenient word, of Hispano-American origin, is used extensively all over the Pacific to express the high perpendicular clefts through which many of the rivers of the west flow often for miles. These cañons are generally found where the river breaks through some mountain range or other obstruction of a like nature on its way to the ocean. Such are the cañons of the Stiken in Alaska, the cañons of the Fraser in British Columbia, the "Gorge" of the Columbia or the cañon of the Colorado in Sonora. An examination of these cañons shows them to have been caused by the force of the rivers which flow through them when these rivers contained (as there is every evidence to prove they did at one time) a greater body of water than at present. During the time when these glaciers covered the sides of the Cascade and other ranges adjoining these rivers, a greatly increased amount of precipitation would swell the volume of these streams, enabling them to score so deeply the surface of the plateau, and "force mountain barriers to reach the ocean, cutting deep channels in its shores where we now found them." These rivers seem at one time to have been merely the outlet of great lakes which emptied themselves into the ocean by one or more small rivulets, creeping through the opposing barrier of mountains by rocky gorges or volcanic clefts. Gradually they seem to have enlarged these clefts until a greater body flowed through them. Some of the lesser emptiers were cut off, and joined their volume to the main stream, giving it importance and strength until in the course of ages they graved their record in the huge rocky cañons through which they now flow—the great descendants of the humble outlets by which they once found their way to the country on the other side of the Cascade Mountains and to the Pacific. It appears that many of the rivers of the west have, at one time or another, changed their course and bed. Some of these changes seem to have occurred in very remote times prior to the present arrangement of the superficial formations. At all events the gold-miner now and again comes upon these old river-beds in the course of running his drifting-tunnels or sinking his mining-shafts. They look eagerly for them, as they are generally rich in gold. Other

* Proc. California Academy of Sciences, vol. III. p. 272.

changes seem to have occurred in very recent times, and seem to have been mainly owing either to the causes I have attempted to portray or to some volcanic action, resulting in throwing the river out of its former course into a new channel. Such is the *grande coute* of the Columbia River well known to all voyageurs. I have spoken of the great cañon of the Colorado River, of which the first published account is contained in the work of Castenada, giving a description of the expedition of Don Francisco Vasquez de Coronado in search of the "Seven Cities of Cibola," in 1540-1, during which time they discovered this river, and named it the *Rio de Tison*. The walls of this cañon are probably 5000 feet in height, and when we consider that the river traverses a magnificent defile of this description for upwards of 200 miles, the effect of the scenery may be imagined. Many years ago, it is said that a party of trappers built a large boat, and made the attempt to descend the river through the defile of the cañon, and were never heard from afterwards; they probably dashed their boat in pieces, and were lost by being precipitated over sunken rocks or high falls. In 1857 Lieutenant Ives, of the United States Army, attempted the exploration of this great gorge with a light draught steamer, but without success; and in 1863 another attempt was made, but resulted in equally unfruitful results.* Here then is a field where some of those young men who seek athletic laurels in the hackneyed Alps may expend some of their superfluous cash and muscular power, with the additional advantage of probably being likely to add something to our geographical knowledge! An almost equally stupendous cañon is that of the Red River of the south. This cañon shows that these remarkable defiles were not formed by any paroxysmal convulsion of nature, for when a tributary stream enters the main river it passes through a tributary cañon. The action of rivers in forming such gorges as these in geological and modern times is an important but much neglected subject in geology.

3. BENCHES.—On the banks of many rivers of the western slope of the Rocky Mountains are found curious terraced "benches," not unlike in general appearance to the famous "Parallel Roads of Glen Roy," but (without stirring up such debatable ground) altogether different in character. These "benches" are always found to the east of the Cascade Mountains, and are well seen at Lilloet on Fraser River in British Columbia. Lord Milton and Dr. Cheshle figure them in their "North-West Passage by Land," as seen at this point. These benches are generally flat and of a good soil, though,

* In August, 1865, I sent a detailed account of this attempt to Sir R. L. Murchison; but it met the fate of many such documents, and never reached him.

as everywhere else to the east of the Cascades, very dry. From what I have already said in reference to the formation of cañons, I need scarcely enter into any long explanation of their origin, as it is at once self-evident, if the explanation I have given of the formation of the clefts just named is correct. In a word, the benches were formed when the Fraser (or other river) was a lake only emptied by some little streams (or stream), now and then gathering strength, and as barrier after barrier was broken down, these benches mark the successive stages of the lowering of the lake's margin until it finally sinks into the channel of the river. I have supposed these breaks to have occurred at intervals as some portion of the wall of the gorge gave way or wore away. This level may have continued for years—it may be centuries—when another break happened, and so on; the height of the "bench" marking the character of the gap made each time. These breaks may have been (indeed no doubt were) assisted by the volcanic disturbances which at a comparatively late period seem to have riven all the country in that region, and volcanoes in the mountains through which these rivers flow were the active agents of disruption. The same "benches" can be seen more or less distinctly wherever the physical contour of the country is the same, or where a river is barred from reaching the sea, under similar conditions to what the Fraser bears to the Cascade Range. That these benches were not connected with glacier action is shown (among other proofs) by the rich character of the soil and the total absence of *moraines*, or other marks of glacier-action. These broadly-marked "benches" ought not to be confounded with some terraces found on various rivers, such as the Columbia, &c., to the west of the Cascades. These terraces are probably connected with glacier-action when the mouth of that river was hollowed for more than a hundred miles of a great and uniform depth. The channel of the Golden Gate (San Francisco) has a maximum depth of nearly 50 fathoms, being greatest immediately in the line of the axis of the chain through which it is cut, while the bar without and the bay within are silted up to within less than 10 fathoms of the surface. The Straits of Carquenes, near the mouth of the Sacramento, have a maximum depth of 15 fathoms, and in the line of the range which bounds them an average depth of 14. Dr. Newberry* thinks that these phenomena are due to glacier-action of a similar character to that which hollowed out the fjords, and on the whole there seems some reason to accept his theory with reservations. On passing down the Columbia from the

* "Pacific Railroad Surveys," vol. vi. p. 42.

Dallas to the Cascades a curious feature is seen, which, though scarcely strictly coming under either of the headings of this paper, is yet interesting as helping to explain some of the phenomena of bench and cañon. Under the water can be seen, standing upright and firmly rooted in the soil, the remains of a forest of *Abies Douglasii*, Lindl. General Fremont notices this in his voyage down the river and attributed it to a landslip. This explanation may be easily proved to be erroneous, and must, I think, though generally received without investigation, give way to a totally different one. The vicinity of the Cascade exhibits marks of recent volcanic action, and disturbance of the traps, red scorie, &c. The Indians even say that at one time the river used to flow under an archway, but that during an eruption of Mount Adams this bridge was thrown down, forming an island in the centre, and helping to give rise to the "Cascades." The effect of this would be to form a dam in the river, raising its waters above the scene of disturbance, and submerging the forest which grew down to its margin. The very recent date of this submergence is shown by the sound character of the wood. The "bench" is also well figured in the plate of the Cañon of Punc-see-que Creek (Oregon), in volume vi., p. 85, of the 'Pacific Railroad Surveys.'

This paper will be printed at greater length in the 'Journal,' vol. xxxix.

Mr. E. WYRMER, in compliance with an invitation from the President to state what he knew of the subjects of the paper, said that he had seen so few of the fjords in Greenland, that he should not like to generalise about them. With regard to those he had visited, it appeared to him true that, at some earlier period, they had been filled by glaciers; but he doubted whether the fjords had been excavated by them. There was nothing to show that any excavation of the sort had occurred. We found in the fjords generally lee sides, that was to say, unworn sides, to the rocks, which would not have been the case if the fjords had been excavated by glaciers.

Dr. BALL wished to impress upon the meeting that there was a great difference between gorges in mountainous regions and true cañons. The true cañon could be formed only in a dry climate, by a river passing over sedimentary rocks, and gradually and slowly eroding its way through them. The cañon was thus a very distinct formation from the chasms and gape we saw in Switzerland, and other mountain regions. Those might be caused in a variety of ways; but the true cañon was formed by a stream grinding for ages and ages in a dry climate through sedimentary rocks, where there was no heavy rainfall or floods to wash away the sides of the chasm.

Dr. HAY said the fjords he had seen in Greenland all bore marks of ice very high up. Even on the fjord at Fredericks hope he distinctly saw the marks of ice, as if a glacier formerly reached the sea there, though now no glacier was given off. The very next fjord to that continued to give off glaciers. He believed these fjords were formed, in great part, by glacial action. The glaciers gradually wore away the rocks, and the action of the streams flowing from the rocks helped to cut them away at the same time. Of the cañons he could not speak, but he could say that Mr. Brown's description of the Fraser River was perfectly accurate.

Ninth Meeting, 22nd March, 1869.

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT, in the Chair.

PRESENTATION.—*Warrington Smyth, Esq.*

ELECTIONS.—*Edmund W. Ashbee, Esq.; Charles Atlee, Esq.; William Carr, Esq.; Frederick Fitch, Esq.; Colonel Barnett Ford; Henry Fawcett, Esq.; Charles Livingstone, Esq.; Delmar Morgan, Esq.; Alexander B. St. Clair, Esq.*

ACCESSIONS TO THE LIBRARY FROM THE 8TH TO THE 22ND OF MARCH, 1869.—‘Instructions for the Navigation of the Northern Pacific Ocean.’ By A. G. Findlay. Donor, the author. ‘Tree and Serpent Worship; Sanchi and Amravati Topes, India.’ By James Fergusson. 1869. Donor, Alfred Davis, Esq. ‘Greater Britain.’ By Charles W. Dilke, Esq. 1869. Donor, the author. ‘Results of a Tour in Dardistan, Kashmir, Little Tibet, Ladak, &c.’ By G. P. Leitner. Donor, the author. ‘Sounding Voyage of H. M. S. *Hydra*, Captain Shortland.’ Donor, the author. ‘A Descriptive Hand-Atlas of the World.’ By J. Bartholomew. 1869. Donor, the author. ‘Trans-Himalayan Explorations during 1867.’ By Captain Montgomerie. 1868. Donor, the author. ‘Direct Commerce with the Shan States and West of China.’ Forty-eighth Memorial from the Wakefield Chamber of Commerce to the Lords of H.M. Treasury. 1868.

ACCESSIONS TO THE MAP-ROOM SINCE MEETING OF MARCH 8TH.—4 Atlases and 20 Maps. By Sir R. I. Murchison, K.C.B., President. Royal Atlas of Modern Geography. By A. K. Johnston. 1861. Complete. Royal Illustrated Atlas of Modern Geography. By H. Fullarton and Co. (Parts deficient, Nos. 2, 3, 4, 5, 6, 7, and 22.) Karten-Atlas zu Dr. A. v. Middendorff’s Reise in dem nuersten Norden und Osten Sibiriens. 1856. Carte du Canal de Nicaragua. By F. Belly. 1858. Ancient Map of the World, viz. ‘Apographon Descriptionis Orbis Terrarum.’ About 15th-century. Published in 1797. Discoveries in the Arctic Sea between Baffin’s Bay and Melville Island. By Captain H. T. Austin, C.B., and other officers in search of Sir John Franklin. 1850. Chart of the North-West Passage, discovered by Captain McClure, H.M.S. *Investigator*, 1850. Melville Island and Prince Patrick Land, showing the Explorations of Captains McClintock and Meham.

MS. Arctic America: Discoveries of the Searching Expeditions under the command of Captain H. T. Austin, R.N., C.B., and Captain Penny. 1851. Geological Map of Europe, according to the researches of Sir Roderick I. Murchison, R.C.S., and J. Nicol, F.R.S. Constructed by A. K. Johnston. 1856. Map of Ireland, showing the heights by gradations of shade, to accompany the Report of the Land Tenure Commission. 1845. Four sheets of the Government Map of Bavaria, viz., Nos. 85, Traunstein; 92, Auerberg; 93, Reichenhall; 94, Berchtesgaden. The Eastern Alps, a MS., drawn by Mr. Gartner for Sir R. Murchison. Esquisse de l'Herzégovine et du Montenegro. By H. Br. de Beaumont. Corrected by A. Boné. 1861. Karte des nördlichen Ural, on 2 sheets. By the Ural Expedition. 1847-50. Map of Aderbeijan. By N. Khanikoff. 1862. Map of Turkestan, in Russian characters. 1867. Map of Khiva and the surrounding country. By J. Arrowmith. 1841. A Russian map of Khiva, showing the theatre of war (in Russian characters). By C. Zimmermann. 1840. A map of the republic of New Granada, dedicated to Baron de Humboldt by Col. Joaquin Acosta. 1847. Victoria, western portion; showing the various trial lines surveyed for projected railways from Port Phillip to the Murray River. 4 sheets. 1855. By G. C. Darbyshire, C.E. Comparative Size of the Scales of the Government Surveys of European Countries, shown by squares. Five outline maps relating to the engraving and shading of hills, by the trisinto and medallion process. Island of Teneriffe. By L. de Buch. 1814. A map of the South-Eastern Alps (Austria). By Julius Payer. Presented by A. Petermann. A Map of Tibet, showing the Gold-fields and Sources of the Indus. By a Pundit. Presented by A. Petermann. French charts, 70 sheets, and 16 books of pilotage.

The President observed that the paper about to be read that evening was by Professor A. E. Nordenskiöld, a distinguished man of science who had accompanied all these memorable expeditions to Spitzbergen, and by Fr. W. von Otter, of the Swedish navy. The Swedes, though not a rich nation, were undertaking for the third time an expedition into these arctic regions. It was a great honour to the Swedish nation that they had accomplished so much in exploring the physical geography of Spitzbergen and of the neighbouring sea.

The Papers of the evening were the following:—

1. *Account of the Swedish North-Polar Expedition of 1868, under the command of A. E. NORDENSKIÖLD and FR. W. VON OTTER.*

(EXTRACTS.)

THE study of the natural history of the polar regions has been of late years prosecuted in Sweden with so much interest that, exclu-

sive of the present year's undertaking, no less than three * separate expeditions have been sent out from this country to the arctic seas. When Nordenfjöld last winter again brought forward a proposal for a new expedition, on a different plan, which was to set out in the autumn from the northern coast of Spitzbergen and penetrate farther northward, the means requisite to defray the expenses of the expedition were in a few days raised in the second city of Sweden, Göteborg [Gottenburg], at the instance of the resident governor, Count Ehrensward. When, moreover, the Government, in order to assist the undertaking, fitted out and manned the steamship *Sofia*, well adapted for the purpose, strongly built of Swedish iron, and originally intended to carry the mails over the Baltic in winter, the new expedition was enabled to assume a more extensive character and embrace a wider compass than had originally been intended.

Most expeditions of this kind have had for their object to attain as high a degree of north latitude as possible; but a glance at their history will convince us how difficult and uncertain the attainment of this object is, and how frequently an insignificant circumstance has obliged the, in other respects, best planned expeditions to return without any scientific result whatever,—a contingency which there would have been no reason to apprehend if proper care had been taken in the scientific furnishing and manning of the expedition. In order to remove all fear of the new Swedish expedition

* These were the following:—

The Expedition of 1858, fitted out at the expense of Otto Torell. The following gentlemen took part in the undertaking: O. Torell, A. E. Nordenfjöld, A. Qvenerstedt. The Expedition visited the western coast of Spitzbergen, and brought home considerable zoological and geological collections.

The Expedition of 1861, fitted out at the public expense. The gentlemen who took part in the expedition, besides the proposer and chief, O. Torell, were A. von Geöe, A. T. Malmgren, F. A. Smith, G. von Yhlen, zoologists and botanists; B. Lilliehöök and W. Kuglenstjerna, commanders of the vessels; C. W. Blomstrand, C. Chylenius, N. Dunér and A. E. Nordenfjöld for geological and physical investigations. The expedition visited, in both vessels, the western and northern coasts of Spitzbergen, made extensive journeys in boats for the purpose of constructing a topographical and geological map of the group of islands, and of examining the northern part of the triangulation for degree-measuring, which the present President of the Royal Society, General E. Sabius, as early as 1825, proposed to get executed, in these high northern regions, and lastly brought home with them a collection of materials for studying the fauna, flora, and geology of the islands, probably not surpassed in completeness by any similar collections from districts situated at so great a distance from the centres of civilisation.

The Expedition of 1864, fitted out at the public expense, chiefly for the purpose of continuing the survey for the measurement of the degree. The gentlemen who took part in the undertaking were A. E. Nordenfjöld, chief, N. Dunér and A. J. Malmgren. The expedition visited the southern part of Spitzbergen and Sturford, completed the survey for the degree-measuring, and brought home rich geological, zoological and botanical collections.

having a result of this kind, it was determined that in this, as in the preceding Swedish arctic expeditions, a continuation, as general as possible, should be made of the researches in natural history commenced by their predecessors. For this purpose the expedition was, by the Royal Academy of Science in Stockholm, provided with a carefully selected and appropriate scientific apparatus,* and was accompanied by as numerous a body of professional scientific men as room and circumstances permitted.

The plan of the journey was, during the summer and early part of the autumn, to pay a visit in the *Sofia* to Beeren Island and Spitzbergen, and carefully examine both the marine and terrestrial fauna of both lands; their flora, both phanerogamous and cryptogamous, as also their geography and geology. It was also intended to make deep soundings, and to take meteorological and magnetical observations, &c. A supply of coal was to have been deposited by a ship, hired for that especial purpose, at some fitting spot on the north-west corner of Spitzbergen, which is accessible till late in the season; which tract the *Sofia* was accordingly to visit during the course of the autumn, and whence some of the scientific men were, in the beginning or middle of September, to return in one of the colliers to Norway. The rest were to endeavour, in the *Sofia*, to make their way farther north, and, if necessary, to pass the winter (circumstances permitting) in some appropriate harbour of the Seven Isles, which form the Old World's most northern archipelago.

The gentlemen who took part in the expedition were:—*Geologist*,—A. E. Nordenskiöld; † *Captain*,—Fr. W. v. Otter, Royal Swedish Navy; *Lieutenant*,—A. L. Palander, Royal Swedish Navy; *Physician*,—C. Nyström; *Natural Philosopher*,—S. Lemström; *Zoologists*,—A. E. Holmgren, A. J. Malmgren, F. A. Smitt; *Botanists*,—Sv. Berggren, Th. M. Fries; *Geologist*,—G. Nanckhoff.

The vessel was manned by fourteen seamen, together with zoological conservator Svensson, and six dredgers, hired in Norway. The ship placed at the disposal of the expedition having been, under the inspection of Captain von Otter, duly fitted out in Carlscrona, and furnished with provisions for something more than a year—or, when account is duly made of the game that in these

* The London Royal Society and the University of Helsingfors contributed to the instrumental apparatus of the expedition.

† The geographical and hydrographical researches were to be performed by Nordenskiöld, von Otter, and Palander. These last—of whom, in consequence of their office, one was almost always on board—also took upon themselves the meteorological observations. Nyström assisted the zoologists, and also directed his attention to the remarkably interesting hygienic features of these regions.

parts one may always reckon upon, for about a year and a half—and touched at Göteborg to take on board the scientific apparatus and the men of science who took part in the undertaking, anchor was weighed on the 7th of July. The 16th-20th Tromsø was visited for the purpose of taking in coal, &c.

On the 22nd the *Sofia* cast anchor in the southern harbour of Beeren Island, where some members of the expedition landed to study the natural phenomena of a place difficult of access on account of the want of a good harbour; while the remainder continued on board the vessel, which cruised in the neighbourhood, and occupied themselves with soundings and with an examination of the local marine fauna.

The expedition left Beeren Island on the 27th of July. Our course was directed to the eastern coast of Spitzbergen, which had not been visited by any of the previous Swedish expeditions; but already at South Cape we met with ice, which, as we approached the Thousand Isles, became more and more abundant, and we were obliged to turn back. After some hesitation as to whether we should wait at South Cape till the water became more free from ice, in order to proceed further eastward, or immediately begin the scientific operations on the west coast of Spitzbergen that entered into the plan of the voyage, we embraced the latter alternative; and it was very fortunate that we did so, for on our return home we learned that the east coast, during the whole summer of 1868, had been rendered completely inaccessible by the ice.

Our course was now directed to Ice-fjord, where the *Sofia* cast anchor on the morning of the 31st of July. We continued a fortnight in the different harbours of that extensive fjord, and penetrated, in our boat-excursions, to the innermost parts of the fjord's northern arm, which had not previously been visited by the Swedish expeditions. During this time all the members of the expedition were busily occupied in scientific researches, and in collecting objects of natural history. The change was, indeed, advantageous, as well for our zoological and botanical as especially for our geological investigations.

The previous Swedish expeditions had pretty fully explored the principal features of the geology of Ice-fjord, and had found it, in consequence of the varying strata on its shores, full of different types both of animal and vegetable remains, and unusually rich in materials illustrative of the geological history of the extreme north.

Innermost in the fjord are found immense, probably Devonian, beds of red clay-slate, and sandstone, which, however, do not here contain petrifications. On them lie strata of limestone, gypsum,

and flint, filled with large coarse-scaled mountain-limestone brachiopoda; then come Trias beds, with large nautilus forms and remains of Saurians; after these, Jura strata with *Ammonites*; then Tertiary strata, in many places rich in plant-impressions, indicating a former temperate climate; and, lastly, scanty remains of Post-tertiary strata, with plant-fragments and sub-fossil marine shells, some of which now first occur in living condition in the northern parts of Norway. The preceding Swedish expeditions had brought home specimens from all these strata;* not, however, sufficiently numerous to give a geological representation of the place's former history so complete as the importance of the subject requires. To supply this defect was one of the chief objects of the expedition of 1868; and we succeeded in bringing home unusually rich collections, especially of plant-impressions and trias petrifications, which, when duly studied, will, no doubt, throw much light on the condition of the climate and arrangement of the land of the arctic regions at that remote period.

Spitzbergen, as is generally known, is at present frequently visited by Norwegian ships engaged in walrus and seal fishing, or in fishing for the "luakjoering" (*Scymnus microcephalus*) on the banks beside the island's coast. The walrus is, however, now but very rarely met with on the western side of Spitzbergen; and its fjords are therefore only occasionally visited for the purpose of taking in water or hunting the reindeer. On how large a scale the hunting of these animals may be carried, is evidenced by the circumstance that the vessels fitted out from Tromsø alone in 1868, according to official returns, killed 996 head. From Hammerfest the returns are still greater; whence one may conclude that, in spite of the war of extermination which, under the name of hunting, has for some time been carried on against these animals, two or three thousand head are annually slaughtered. If we compare that number with the scanty extent of ice-free meadow-land in Spitzbergen, we are tempted to suppose that an immigration must take place from Novaja Zembla, which, nevertheless, is scarcely possible, unless some large island or group of islands facilitate the communication between these two countries, situated at a distance of between 400 and 500 sea miles from one another. Of late years the Norwegians have resumed the method, formerly employed by the Russians,

* The first mountain-limestone petrifications in Spitzbergen were found by Parry in 1827, at Cape Foulshawe, and the same year by Keilhan at South Cape. Jura fossils were first discovered by Lovén in 1858; the tertiary plant-remains by Nordenfalk in the Swedish expedition of 1858; the Trias strata by Blomstrand in 1861; the post-tertiary beds, containing *Mytilus*, by Forrell, Malmgren and Blomstrand in 1864; the Saurian strata by Nordenfalk in 1864.

of using large nets, formed of rope, to catch the Beluga (*Delphinapterus leucas*); and in 1868 several vessels were fitted out exclusively for that species of fishing. Some of the fishermen whom we met had, on one or two occasions, taken from twelve to twenty head at a single drag of the net: right handsome sport, when one considers that the *Delphinapterus* is often larger than the walrus itself.

Ice-fjord, like most of the other gulfs of Spitzbergen, is surrounded by vast glaciers with their mouths turned towards the sea, which offer to the geologist an opportunity of studying that important phenomenon in the history of the earth's development. But also extensive valleys or declivities free from ice and snow are met with, especially in the inner parts of the fjord, and the fertile soil here produces a vegetation more luxuriant than in other parts of this island group. One may here see whole fields yellow with poppies (*Papaver medicinale*), or covered with a thick green and red carpet of the beautiful *Saxifraga oppositifolia*. The fjord, which lies beneath them, and in the summer months is often as still and clear as a looking-glass, abounds with marine animals of various kinds. Everything contributes to make this a most important spot for the study of both animal and vegetable life in the Arctic regions. The zoologists and botanists of this expedition here gathered a rich harvest; among the results of which we may mention the taking of several fine salmon, and fully-developed examples of the esculent mushroom, &c.

We left Ice-fjord on the 13th of August. At the entrance a boat-party was sent out northward, to map and examine geologically Foreland Sound. Their work was now—as during the expedition of 1861, when Blomstrand and Dunér sailed through the sound—rendered difficult by almost perpetual fog. During this time the vessel made a somewhat longer excursion westward for the purpose of making soundings: which, however, were on the occasion rendered almost impossible by the heavy swell. We had arranged to meet at King's Bay, whither both parties came on the 17th, in the afternoon. Several zoological, botanical, and geological excursions having been made from this point, and a large number of miocene fossil plants collected, the *Sofia*, on the 19th, proceeded on her course further northward.

We had hoped here, in some degree at least, to reinforce our already considerably diminished stock of coal, but we soon found that that would necessarily cause too great a delay. In fact, whereas, more to the south, the tertiary formation occupies the greater part of the extensive peninsula between Ice-fjord and Bell Sound, and there in many places forms mountains of above a thousand feet high,

at King's Bay, on the contrary, its extent is very inconsiderable, so that at present it forms only a few small hills consisting of strongly folded strata, and separated from each other by the furrows cut by the glacier-streams. By this the supplies of coal, notwithstanding the by no means inconsiderable thickness of the beds and their accessibility (they lie only a few hundred feet from the shore of one of the best harbours in Spitzbergen), become of but little value, especially as the frost, which begins at a very short distance under the surface, renders the breaking of them extremely difficult; in fact, in consequence of the ice-drenched coal's extreme toughness, almost impossible without regular mining. It is even to be expected that the whole of what still remains of the miocene formation of this spot will, in a comparatively short period, be washed away.

Late at night, on the 20th August, the *Sofia* anchored at Amsterdam Island, and the following day we had the pleasure of hailing the first of the ships which had been hired in Norway for the expedition for the transport of coals. A coal depôt having been established on the low tongue of land that shoots out south-eastward from Amsterdam Island, and five of the scientific members of the expedition having been, together with necessary tents and boats, landed at Kobbe Bay, to prosecute there their zoological, botanical, and physiological researches, the *Sofia* sailed off with the rest on a sounding-tour towards Greenland. Our intention was to penetrate thither along the 80th degree of N. latitude, but before we had reached the longitude of Greenwich we were met by impassable masses of drift-ice. It was evident that the coast of Greenland was accessible only at a latitude much lower than was compatible with the plan of our voyage. We therefore turned our course north and north-east, and gradually, after innumerable zigzags in the ice, arrived at $81^{\circ} 16'$ N. latitude. The temperature had now sunk to 0° (centigr.), with thick ice, fogs, and snow-storms. The ocean was sometimes covered with a thin coating of new ice, and the old ice northward was quite impassable, so that we were obliged to seek a passage out in a south-easterly direction. After another vain attempt to reach Depôt Point, in Brandewijn Bay, the *Sofia* anchored, on the 29th, in Liebo Bay.

During the passage of the *Sofia* from Norway to Spitzbergen, its officers, Captain Baron von Otter and Lieutenant Palander, took a number of soundings in the deeper parts with a "Bulldog" apparatus of the same kind as that constructed at Tromsø, by Torøll and Ohlydenius, for the voyage of 1861, and which was found to be particularly applicable. These soundings were zealously continued during our cruising amid the drift-ice between 80° and 82° , and

gave very interesting results not only as regards the ocean's depth in the parts visited by us, but also concerning Arctic animal life at the greatest measurable depths. It showed us that Spitzbergen may in a manner be looked upon as a continuation of the Scandinavian peninsula, inasmuch as that island-group is not separated from Norway by any very deep channel (not above 300 fathoms), whereas a little to the north and west of Spitzbergen there is a depth of 2000 fathoms and more. From these great depths specimens of clay were brought up by the Bulldog apparatus, which, on immediate and close examination, were found to contain not only several microscopic but even larger and tolerably highly organised animal forms (e.g., several kind of crustacea and annellata). The greatest depth from which any specimen was procured was 2600 fathoms, and the mass there raised consisted for the greatest part of white and red Foraminifera, in general scarcely so large as a pin's head. It is, moreover, deserving of remark, that, during our cruising amidst the ice, we met with and collected, not only a number of pieces of drifting wood, but also (as, for example, at 80° 40' N.) glass balls of the kind used by the Norsemen at their Loffoden fisheries for floats; an additional proof of the already well-established fact* that the Gulf Stream reaches, though in a greatly weakened state, even these tracts.

Liebde Bay had never before been visited by any scientific expedition, and its topography and geology were accordingly entirely unknown. A boat-party, consisting of Malmgren, Norden-skiöld, and Nyström, with three men, were therefore left here, while the ship went to fetch their comrades who had been left at Kobbé Bay. The boat's journey was favoured by calm and mild weather and a clear sky; although a high wind, accompanied by snow-storms, prevailed out at sea—a circumstance very common at Spitzbergen, and which is said especially to characterise that beautiful and, according to the unanimous testimony of the fishermen, appropriately named fjord. We were thus enabled, during the few days that our boat-voyage lasted, to map it, and ascertain the character of its somewhat uniform geology. Its shores are occupied exclusively by the same red, green, and dark grey kinds of slate, which in Ico-fjord are covered by mountain-limestone strata with *Producta*, and in Mount Hecla form the uppermost stratum of the vast series of schists to which the name of that mountain has been applied. But, as yet, no petrifications had been discovered in these strata. Their age was

* Among the already given proofs of this may be mentioned, that Torell, in 1861, at Shoal Point, met with a bean that had come from the Gulf of Mexico, the *Estada gigantellum*.

accordingly somewhat doubtful, and the probably Devonian fish-remains which we now found here are therefore a discovery of great value in the explanation of Spitzbergen's geology. The lower slate-beds contained some vegetable remains, though probably of too indistinct a character to admit of identification.

On the 2nd of September, the boat's company and the ship, returning with our comrades from Kobbø Bay, met at a little distance off the promontory that separates Wijde Bay and Liebde Bay. After remaining in that bay a couple of days longer, the *Sofa* weighed anchor and touched at the now ice-free Cape Dépôt, in Brandewijne Bay, in order to fetch away the supply of pemmican that (in 1861) had been left there, an iron boat, &c. We thence steered northward, with the intention of passing round Nordostland to Giles' Land. The greatest part of the arm of the sea that lies between the Seven Islands, Cape Platen, and North Cape, which, in 1861, was already, in the middle of August, perfectly free from ice, we now, in the beginning of September, found covered with a firm crust of ice. It was therefore impossible to reach Giles' Land by this route, and we were therefore obliged, after having, for the purpose of botanical and zoological researches, remained a short time at Castien's Islands and Parry's Island, which last, being still encompassed by a girdle of land-ice, was approachable only by walking over the ice, to seek another passage, namely, that through Hinlopen Strait. Our course was directed to its southern part.

Already, before the end of September, some signs of the approach of autumn had been visible, and the hill-tops had frequently in the morning been for some time covered with a white mantle of new-fallen snow, which, however, had melted away again without causing any hindrance to our scientific pursuits. But now, during our passage to South Waijgate Islands, a copious fall of snow rendered all further researches in natural history on land impossible, and gave us pretty clearly to understand that the season for our purely scientific pursuits was to be considered as at an end. We accordingly turned back at Mount Lovén, in the southern part of Hinlopen Strait, having first on that spot collected, from under snow of a foot deep, an additional number of mountain-limestone petrifications. On the 12th of September we again anchored at our coal dépôt on Amsterdam Island, and there met our second coal-ship, by which some of the members of the expedition (Fries, Helmgren, Malmgren, Nauckhoff, and Smitt) returned to Norway, carrying with them the valuable collections of objects of natural history which the expedition had up to that time succeeded in acquiring. These collections have now happily arrived in Stockholm, and will, after having been

duly studied, be divided between the National Museum in that city, where already the extraordinarily rich Arctic collections formed by the preceding Swedish expeditions are preserved, and the Museum of Göteborg, the city whose liberal initiative first gave occasion to the new expedition. To give an idea of the extent of these collections, I need only refer to the notices above given of our geological operations, and remark that the zoological sciences were represented by no less than three members of the expedition, who, besides, had with them a taxidermist. Messrs. Malmgren and Smitt had also at their disposal a boat manned with four men for dredging every day, holidays excepted, when the ship lay still. They were thus enabled not only to make a searching examination of the Arctic marine fauna, which, in individual copiousness at least, is comparable with that of many more southern countries, but also to pay due attention to the terrestrial fauna of the locality, more especially the entomological branch, which is poor both with respect to individuals and species, and accordingly presented especial difficulties to its investigator, Mr. Holmgren. The dredgings also yielded rich contributions to the ocean's alga-flora. Every opportunity that offered itself for land-excursions was used by the two botanists of the expedition, both for investigating the flora and for forming a collection of specimens for normal herbaria of Spitzbergen's phanerogamia, mosses, lichens, and alga.

On the 16th of September we took leave of our homeward-bound companions, and immediately proceeded northward. Our intention was to touch at the Seven Isles, but these were now found to be still more thickly surrounded by ice than when we had visited that tract about a fortnight before. We accordingly determined to avail ourselves of a channel tolerably free from ice, stretching northward from those islands.

After a number of zigzags amidst the drift-ice, our vessel, in longitude $17\frac{1}{2}^{\circ}$ E. from Greenwich, succeeded in arriving at $81^{\circ} 42'$ N. latitude, probably the highest northern latitude a ship has ever yet attained. Northward lay vast ice-masses, it is true as yet broken, but still so closely packed that not even a boat could pass forward, and we were therefore obliged to turn to the south-west and seek for another opening in the ice; but we found, on the contrary, that the limit of the ice stretched itself more and more to the south the more we went to the west, so that, on the 23rd September, in the longitude of Greenwich, we were south of the parallel of 79° N. latitude. On the way we had in several places met with ice black with stones, gravel, and earth, which would seem to indicate the existence of land still further north.

The ice itself had, moreover, a very different appearance from that which we had met in these tracts at the end of August. It consisted now, not only of larger ice-fields, but also of huge ice-blocks, so that it seems as if the former ice had drifted to the south, and given place to new ice-masses coming from the north. The temperature had now sunk to 8° or 9° (centigr.) below the freezing point, and the ice, which in these parts had before been of tolerably loose texture, had now become so compact that any more violent collision with it was combined with no little danger. Furthermore, the nights were now so dark that it was necessary at that time to lay the ship to by the side of some large sheet of ice, at the hazard of finding oneself blocked up there in the morning. Already, in the beginning of September, the surface of the ocean, after a somewhat heavy fall of snow, had shown itself, between the ice-masses, covered with a coating of ice, which, however, was then thin, and scarcely hindered the vessel's progress. Now it was so thick that it was not without difficulty that a way could be forced through it. All things clearly indicated that the season of the year, during which it is possible to sail in these tracts, was nearly at an end, and as we intended to make yet another attempt to find a north passage from the Seven Isles, or seek a harbour for the winter, we determined to return to our coal-depôt.

On the 25th of September the *Sofia* once more cast anchor at the north-west corner of Spitzbergen, after having slightly struck upon a rock situated under the surface of the water in the middle of South-gat, and which has been forgotten in Buchan and Franklin's admirable chart of that harbour, although it appears, from Beechy's description, that they themselves happened to strike on the same shallow.

After a few days' rest, spent in inspecting the engine and taking in coal (the last remains of our store of coals had to be searched for under a thick covering of snow), and after having placed in the letter-box on the island in Kobbé Bay notices of our journey and our plans for the future, we steamed away again, on the 1st of October, northward, notwithstanding a strong wind and a snow-fog that prevailed in the harbour we left. Our suspicion that this was only local seemed to be confirmed when we got out a little further north, as the weather became clearer and calmer, but at the same time we met already, in lat. $80^{\circ} 40'$, sporadic blocks of drift-ice, which, as we proceeded farther north, increased in number and size. We continued our northward course during the following day, but it was soon evident that no open water would be arrived at that way, and in the afternoon we were again steering in a southerly

direction. During the night we lay to under cover of a large sheet of ice. The temperature had now sunk to $14^{\circ} 5'$ (centigr.), so that in calm weather the surface of the water between the ice-masses was covered with ice of two or three inches' thickness, which considerably impeded the progress of the ship. But the following day we stood southward till we got into something like open water, and then followed the edge of the ice in a northerly and north-westerly direction. By this means we again arrived at 81° S. lat., but here the *Sofia* met with a misfortune, which put an end to all further efforts to proceed northward. In the morning of the 4th of October, during a storm from the south-east, and with a high sea, the ship was thrown violently upon a huge ice-block, or rather a small iceberg, whereby she sprang an extensive leak. We were therefore forced to turn back immediately and seek our harbour, where we arrived late in the evening, after eleven hours of incessant labour to keep the vessel free from water. Nevertheless, though all took part in this work, the water continually rose, so that, when the anchor was cast at Amsterdam Island, it stood about 2 ft. over the cabin floor. Fortunately the provisions, being kept between water-tight bulkheads, were uninjured, and we succeeded, though with great difficulty, in keeping the engine-room so free from water that the fires were not extinguished. Had this not been the case, our ship must unquestionably, in a short time, have been the prey of the storm and the extremely heavy sea, which now, contrary to our former experience, raged among the thinly scattered fields of drift-ice. Immediately on our arrival at Amsterdam Island the ship was careened and the leak provisionally stopped, so that already the next day we were in a condition to seek a more secure harbour in King's Bay. Here the ship was hauled so close to land at flood, that we, at ebb, were enabled to come at the leak and stop it effectually.

King's Bay, which in summer time is almost free from ice, was now filled with innumerable ice-blocks fallen from the mighty glaciers of the fjord, which, when carried by the flood-tide in towards land, totally barricaded the harbour in which the *Sofia* had taken refuge; and, notwithstanding that the temperature here was considerably higher than in the neighbourhood of 81° S. lat., these blocks froze during the calm weather so fast together, that when we, on the 12th of October, were again in a condition to sail, it was only with the utmost difficulty that our vessel could get out.

Our stay in King's Bay, like all the preceding occasions on which the ship remained any length of time still, was taken advantage of by our Natural Philosopher, Dr. Lemström, for the purpose of making

observations for the determination of the magnetic constants and variations. The ground was, however, too deeply covered with snow to allow of any geological or botanical operations. Even the brooks, so copiously supplied with water in the summer time, which intersect the lowlands adjoining the coal harbour, were now so entirely dried up by the effect of the cold that we endeavoured in vain to reinforce our now considerably reduced supply of water.

Our ship, which had had two ribs broken by the blow that caused the leak, was now too weak to be exposed, with the slightest prospect of success, in any new attempt to force a way through fields of drift-ice, as would in all probability be necessary, should we endeavour to visit the Seven Islands, which place we had intended to make our winter harbour; and the wintering in any other part of Spitzbergen not having either entered into the plan of our voyage, nor promising any results commensurable with the costs, dangers, and hardships of passing the winter there, we determined to return to Norway. But yet we wished to make an attempt to reach Giles' Land round the southern point of Spitzbergen, which was probably still free from ice. Already during our passage along the west coast of Spitzbergen, which in summer is entirely free from ice, we passed large though scattered fields of ice, which farther to the east, near the Thousand Isles, completely obstructed the way. We were, therefore, constrained to relinquish that plan also, and to direct our course towards Norway. After having been once more, on the shallow banks off Beeren Island, during a severe storm and in a high sea rendered to the last degree boisterous by the shallowness of the water, in great danger of being ice-beset, the *Sofia* anchored again on the 20th of October in Tromsø Harbour, where we had the pleasure of learning that our comrades had happily arrived and reached home in safety.

From the above it appears that the expedition, as regards its second object—namely, hydrographical investigations in the Polar Basin—did not succeed in reaching any remarkably high degree of latitude; so that the compass of the portion of our globe that is known to us, has not been to any material amount increased by it. I hope, however, that it has afforded a by no means unimportant contribution to the solution of the so-called Polar question.

A lively controversy has, as is generally known, been of late years carried on between the principal geographical authorities concerning the real character of the Polar Basin, some geographers maintaining that it is covered by an unbroken surface of ice, presenting an impassable barrier to the progress of a ship, while

others look upon this as only an obsolete prejudice, arising in a great measure from exaggerated descriptions of the difficulties which the sailor encountered at the point where he turned back. That this latter view, at least as regards that portion of the Polar Basin that borders on Europe during the actual sailing-season in the Northern Seas, i.e. the summer, is not in conformity with the real fact, has been proved, not only by the adventurous journeys of the older Arctic travellers, but by a number of expeditions sent out during the last century for the exclusive purpose of such investigations, among which may be mentioned:—

Tschitschagoff's 1st expedition, 1765, which with their ship could only reach		80° 21' N. lat.
"	2nd	" 1766, which reached 80 28 "
Phipps'	"	1773, " 80 37 "
Bachan and Franklin's	"	1818, " 80 34 "
Scrooby's	"	1806, " 81 50 "
Sabine and Clavering's	"	1823, " 80 20 "
Parry's	"	1827, " 81 6* "
Torrell's	"	1861, " about 80 50† "

It might then have been considered as already absolutely decided that it was not possible at that season of the year to penetrate very far into the Polar Basin, and any repetition at the above-named season of the year of these attempts could therefore only be looked upon as continually treading in old footsteps, which demonstrably do not lead to the intended object. But one doubt remained. At the season of the year when, in consequence of the heat of the summer and the influence of the ocean-waves and ocean-streams, the ice-masses have been reduced to their minimum—that is to say, in the autumn, before the formation of the new ice, no ship had ever before visited the Polar Basin. One could with certainty foresee that it might then be possible to go farther than in summer. There was a possibility that one might at that season be able to penetrate very far, perhaps to some land lying north of Spitzbergen, which might hereafter serve as base from whence to push still farther onward. These considerations constituted the ground for the plan of operations for the latter portion of the Swedish expedition, and it may now be considered as proved.

That one may, during autumn, reach by ship a latitude considerably higher than that which has been attained by most of the summer expeditions, unless this year is to be considered as unusually

* By ship, but on the ice the party penetrated to 82° 43'.

† By ship, but in boats and by land journeys as far as 86° 43'.

unfavourable with regard to the condition of the ice, we might in all probability have proceeded a considerable distance farther, perhaps beyond 83° N. lat. But we have at the same time convinced ourselves that, even in autumn, farther progress is soon rendered impossible by impenetrable masses of broken ice. The voyage itself, moreover, at that season of the year, in consequence of the cold, the darkness, and the boisterous winds, accompanied by snow-storms that at that time of the year are prevalent in the Polar Basin, and the heavy sea amidst the masses of drift-ice caused by these latter, is rendered so dangerous that the risk to which the traveller exposes himself is far from being compensated by the meagre prospect of success. The idea itself of an open Polar Sea is evidently a mere hypothesis, destitute of all foundation in the experience which has already by very considerable sacrifices been gained; and the only way to approach the Pole, which can be attempted with any probability of succeeding, is that proposed by the most celebrated Arctic authorities of England, viz., that of—after having passed the winter at the Seven Islands, or at Smith Sound—continuing the journey towards the North on sledges in the spring.

The paper will be published entire, with a map, in the 'Journal,' vol. xxxix.

The PRESIDENT, in expressing the thanks of the Society to Mr. Nordenskiöld and M. von Otter for their valuable communication, said that it was a straightforward account of the proceedings of the party in those regions. The nautical part of the paper must be particularly interesting to the many distinguished naval officers present. He hoped some of them would express their opinions as to the value of the definite conclusions which the author of the paper had arrived at. He was very glad Dr. Petermann, to whom the Society awarded their gold medal last year, and who had urged Germany to send out a small squadron to reach the Pole by the supposed open Polar Sea, was not present to advocate his views. The observation of great floating masses of ice, bearing stones and clay, drifting from the north, certainly indicated that it was not all open sea, but that there must be land in that quarter. He should be happy to hear the opinion of Arctic officers on that point, and he would first call upon Sir George Bick, one of their Vice-Presidents, who had so much distinguished himself in such researches, to address the meeting.

Admiral Sir Gideon Mack said the failure of these ships to make the passage, or even to get to any distance to the eastward of Spitzbergen, was a significant fact, because that passage had been advocated by very able Polar officers. Two of those used on a former expedition were sailing-vessels; but the *Sofia* was a steam-vessel, fitted out efficiently for the purpose, and aided by two transports laden with coal, which was deposited at Amsterdam Island. The *Sofia* tried to get to the north, and, failing to do so, did precisely what the *Dorothea* and *Trost* did in 1818, follow the trend of the ice westward, with the view of sighting Greenland, if possible. In this she was baffled, as the former expedition had been; then, going in a zigzag direction to the north, she attained to latitude $81^{\circ} 10'$, and after great efforts succeeded in

attaining to latitude $81^{\circ} 42'$, which the Swedes, with very pardonable pride, considered was the highest degree of latitude ever reached by a ship. Scoresby, however, whose object was not scientific investigation, but the capture of whales, attained in a most favourable season to 82° . There was another resemblance between the Swedish expedition and the expedition of 1818. The *Sofia* got thrown upon a heavy mass of ice and was seriously injured, and had it not been for the power of steam, she might have been lost; but her steam enabled her to go to Amsterdam Island, and subsequently to Smernberg Harbour, where she was repaired. It was to that very place the *Dorothea* and the *Trent* went in 1818—the *Dorothea* to be hove down to repair damages brought about by having been crushed in “taking the pack” during a furious gale. Well, these gallant Swedes, nothing daunted by all these serious circumstances, tried again and again; but the ice became thicker and more compact, and they were less able to advance against it. Ultimately, late in October, they bore up for their own country, and arrived at Tromsø on the 20th of October—the very same thing which the *Dorothea* and *Trent* did, and at the same period of the year, just half a century ago. The parallel showed how very little the circumstances of Polar navigation were altered in the direction of Spitzbergen. He was not going to give an opinion whether the route by Smith Sound, by Nova Zembla, or Spitzbergen, or by that between Spitzbergen and Greenland, was the best to attempt. It seemed to him that it was only by a repetition of small expeditions that the approach to the Pole might be successfully made, namely, by being on the spot when Nature, in some of her favourable moods, might open out the ice and leave a passage clear for an adventurous explorer. He could not sit down without expressing his unequalled admiration of the perseverance and audacity which characterized the Swedish expedition.

Admiral OMMANNEY said he could not extol too much the courage which animated the Swedes in carrying out this expedition. But he should like to have heard something more about the construction of the *Sofia*. He had heard that she was constructed of iron. Success in penetrating the Polar sea depended a great deal upon the way in which the vessel was constructed. If the *Sofia* had been of more substantial construction she would not have encountered the first blow of the ice, as she appears to have done. The masses of ice met with, covered with stones and earth, was to him a hopeful indication of our being able to reach the North Pole by way of Spitzbergen, of which he had always been an advocate. He hoped the failure of the present expedition would not discourage those who were in favour of that route. He was happy to see that the point reached by Parry still stood far to the north, and he hoped it would never be surpassed by any other country but England.

Staff-Commander DAVIS was of opinion that the most important part of the communication just read was the fact of masses of ice being seen bearing stones and earth; but Professor Nordenfalk had omitted a singular fact, also observed by the same expedition, and which was recorded in Petermann's 'Mittheilungen,' viz., that in the spring of the year large flocks of birds take flight, going due north from the northern parts of Spitzbergen. This, taken in conjunction with the first-mentioned circumstance, would lead to the belief that land existed to the north.

Admiral Sir EDWARD BELCHER said from what he had heard in this paper, and from what he had collected from Parry and Sir James Ross, he believed the ice which came down, always southerly, on the western side of Spitzbergen, and in such quantities, must cause a vacuum to the northward; and in that vacant space he felt perfectly satisfied vessels might winter, as, for instance, on the north-west of Spitzbergen, and in one of these open seasons find their way to the north. Parry, in his last observations in 1827, after having tried

all these points in the Arctic Sea, pointed out that there was a general pressure from the eastward to the westward. That we know to be the case. In Davis Straits the sea on the eastern side was open, and from an easily understood cause. All the slopes on the western coast of Greenland lay to the sun; the sun never had altitude sufficient to look on the eastern coast, consequently there were no thaws of any importance on that side, nothing to liberate the land-ice and enable it to leave the shore. On the western shore of Spitzbergen, the same rule held; the sun could only play upon that side and liberate the ice there. But if an expedition had to start again, he should advise that *Nova Zembla* should be the point of departure, and that the expedition should endeavour to pass westerly of that island and tumble down, if possible, on to the west of Spitzbergen on the homeward voyage. From what he could collect from the paper, the Swedes were about to try another expedition. He believed what Swedes could do Englishmen could do.

Captain Sir LEOPOLD M'CLURE thought these scientific and gallant Swedes had summarised very completely the experience of a great number of previous Arctic expeditions which had visited the same seas. The Swedes seemed to have reached within half a degree or so of the extreme northern latitude attained by English explorers; they had met with similar reverses, and they had returned with much the same story to tell. There was one circumstance to be observed. All the ice they had met with was broken-up ice. It was clear they had not arrived at a fixed unbroken barrier of ice, such as impeded the progress of Ross in the south. With a sufficiently strong vessel and powerful steam-machinery they might succeed in penetrating another 100 miles farther to the north—to 83° or 84° —but there they would, he thought, meet with an impenetrable barrier. He was not a believer in an open Polar basin. According to all our experience of temperature in modern Arctic expeditions, we found the farther we went north the colder was the mean annual temperature. There were no indications of approaching a milder climate, as some theorists suggested; we found less animal and vegetable life, and we got far beyond where the Esquimaux could live.

Admiral Sir EDWARD BELCHER quoted from Parry's work the temperatures of the air and sea taken on the expedition in which Sir George Back took part in 1818. There was a whole series of observations given, and they went to prove that the difference in the mean temperature of the air and sea between the Orkneys and Cape Farewell was not so great as we imagined.* He saw

* The journals of Franklin, 1818, Ross in 1818, Parry, 1827, and that of James Ross in Cove, 1837, prove that the sea does not attain a very low temperature as late as September; and that on the coast between the Orkneys and Cape Farewell, the south point of Greenland, in January, February and March, the temperatures are even higher than in summer. That:—

Extract from Admiralty Official Journal of Lieut. Franklin—hired ship Trent.

		Air.	Sea.
Trent on May 30	79.46 N. 13.40 E.	31.0	30.0
" 1 June	80.50 " 9.22 "	24.0	29.0
Beet in ice up to 12th ..	70.50 " 11.0 "	39.5	39.5
Range.—Air .. 26 to 35.5			
Sea .. 29 " 36.0			
June 22nd	80.0 " 10.12 "	32.0	30.5
July 10	80.23 " 10.37 "	42.0	33 surface, 36 at 119
All August.—Mean air ..	34.7	Sea ..	36.7
Min. air ..	30.0	Max. ..	41.0
Min. sea ..	35.0	" ..	39.0

nothing to give us cause to fear from cold weather, or to prevent the use of a steamer; and if the turbine were used, he was perfectly satisfied the action of the turbine would throw off the ice from the sides of the vessel, and enable her to proceed much more safely than she could do with the screw or paddle.

Admiral Sir Graham BACE said the temperatures quoted by Sir Edward Belcher were, he believed, perfectly correct; he could not speak to them himself from memory. But he recollected this fact, and he had good reason to recollect it. It was his duty to take the sun's altitude at midnight, when the sea was invariably frozen on the shady side of the vessel, merely forming a very thin film of ice. On the other side of the vessel it was comparatively warm, and there was a thaw. Sir Leopold McClintock spoke of the large blocks of ice; but in 1818 there were unbroken floes of ice four or five miles in diameter,—the floes remained almost stationary for some time, and the ships were made fast alongside. At length they got a circular motion and opened a space wide enough to pass through, and if they had possessed steamers, instead of heavy old collers, he did not know where they might have gone to.

Admiral COLLINGS said the observations made by the gentlemen who had gone out on this expedition entirely corroborated the views which he expressed before the Society some time ago with respect to the possibility of reaching the Pole. The question was raised whether they should go by Smith Sound

			Air.	Sea.
September 18	70° 0' N.	0° 41' W.	40° 5'	45° 0'
	Off Faro Island.			
30	62° 19'	7° 34'	50° 0'	49° 0'
Sir John Ross anchored, Brans Sound, 1st Nov. 1818.			49° 0'	51° 0'
		Longitude.		
Parry, July 4 to 11, 1827	81° 40'	22° 54'	32° 0'	32° 5.30 = 400 fath.
and 22nd	82° 11'	24° 23'		
	82° 43'	19° 54'	31° 0'	34° 5'
			Sea.	Sea.
			A.M.	P.M.
Corre, James Ross	59° 07'	6° 20'	49° 0'	48° 0'
12 January, 1836	60° 25'	11° 30'	47° 0'	46° 0'
	61° 02'	23° 20'	47° 0'	47° 0'
	59° 34'	30° 13'	47° 0'	45° 0'
25 February	59° 29'	7° 24'	47° 0'	48° 0'
	59° 10'	16° 0'	47° 0'	48° 0'
	59° 0'	20° 5'	47° 0'	48° 0'
20 March	56° 25'	33° 1'	44° 0'	44° 0'
31	54° 42'	41° 0'	39° 5'	39° 5'

Sounded,—27 fathoms, 44° 5'; surface, 39° 5'; air, 34°.

Franklin in conclusion remarks:—

				Degrees.	
Temperature of air between	General state	..	47	46	45
60° and 70° N.	One fine calm day	..	50	52	
During foggy weather .. ..	.. .. .	..	44	42	36
Water .. .. .	.. .. .	..	47	46	45
Decreasing gradually between 60° and 70° to	.. .. .	..	37		
Air between 70° and Cherry Island .. .. .	.. .. .	..	33	32	31
Dane's Island Observatory .. .. .	.. .. .	..	79	40	20 N.
			11	6	15 N.

The approach to ice was not at all indicated by any change; nor do I think from the temperature, either of water or air, that we could have judged of our proximity to Cherry Island and the surrounding sea when we made it, had not the reckoning informed us.

or by Spitzbergen. He then stated that Parry's experience was, that unless you got hold of the land it was useless dealing with an ice-pack; there was no prospect of getting forward at all. Directly you thrust yourself into the pack, you had to go just where the pack chose to take you. Therefore, the only way to get forward in the Arctic regions was to hold by the shore. The observations of these Swedish officers entirely corroborated that view. The most interesting feature contained in the paper was, that masses of ice combined with stones had been found. As far as he could comprehend, these masses of ice and stone had been found to the westward and southward of the north point of Spitzbergen, and he would suggest that it was from there they came. He would expressly call attention to this particular fact, that Parry, when he proceeded to his most northerly point, saw nothing of stones. He had to drag his boats over the ice, and not a particle of stone was found there, not one iceberg was seen. Now, the indications of land to the north would be shown by icebergs: if there was land and open water, there would be icebergs. There was not an iceberg to be seen to the north of Spitzbergen, and from this he contended there was no proof of land to the northward of that point; and if there should be land, our only chance was to get hold of it and coast along. He made these observations in consequence of having traced the pack along Behring's Straits, and seen how impracticable it was to deal with ice in floating masses of that kind.

The PRESIDENT wished some of the naval officers present would tell the meeting what they thought could be accomplished by steam-power in the Arctic seas.

Captain INGLEFIELD, R.N., said he had commanded three vessels in the Arctic regions with steam. There was no doubt steam was of the greatest assistance in getting through ice. Upon several occasions they were enabled to break through ice upwards of 14 feet in thickness; by charging it on several occasions they succeeded in making a crack and in pushing the ship through. With reference to the question of reaching the Pole, he confessed he inclined very much to the route by Spitzbergen, for two reasons. In the first place, while making one voyage to Smith Sound, it was possible to make two or three attempts to reach the Pole by Spitzbergen. The other day, when Captain Sherard Osborn read a paper before the Society, advocating the route by Smith Sound, he was called upon to make some remarks; but he thought it would better serve the interests of the Arctic expedition to abstain from doing so, because he was in favour of the Spitzbergen route; and the Chairman had stated that one of the objections raised by Government to sending out another expedition was that Arctic officers were divided in their opinions as to which was the best route. Nevertheless, he advanced this as one of the reasons for the route by Spitzbergen, that we might make several attempts while we were making one attempt by Smith Sound. He had made one attempt by Smith Sound, and he was sure he should have had a better chance by Spitzbergen. He believed there was an open polar sea, from the fact that there was a strong current setting out of it; and that he had found the trunk of a tree upwards of 20 feet long at the top of Wellington Channel, which must have drifted across that sea.

Admiral Sir EDWARD BIRCHEN said the mode by which stones got into the ice was simply this, that the land-floe attached itself to the gravelly beach, and as the tide rose and fell towards the spring, the ice falling at an inclination broke at last, and the floe carried away with it the gravel that had been attached to it. It was very well known that the 25 feet and 40 feet floe-ice was composed of layers of 8-foot floes piled one above the other.

The PRESIDENT in concluding the discussion said, he much regretted that we were not likely to have the great question of the geography of the North Polar Basin determined by an expedition sent out by the British Government,

but he did not despair of seeing some spirited individual take it up and carry out those measures which the Government had declined to do, chiefly for the reason that Arctic officers differed among themselves as to the route which ought to be taken.

2.—*Notes on a Journey from Ningpo to Shanghai.* By
CHAS. T. GARDNER, H.B.M. Consular Service, China.

THE author stated that having been for nearly eight years in the service of her Majesty's Government in China, and had opportunities of travelling in various provinces of China, he did himself the honour of giving the Society an account of a journey he made in the province of Chakiang, in which he was interpreter and consular assistant during the past two years. The paper contained, more particularly, a description of a journey from Ningpo to Hangchow.

On the 1st June, 1868, his party—consisting of Mons. Eug. Simon, of the Society of Agriculture, Paris, and French Consul at Ningpo; General Cooke, in the service of the Chinese Government; Mons. Novion, in Chinese Government service—started from Ningpo on their journey to Shanghai, *via* Hangchow, in a yacht of about 50 tons' burden, belonging to Cooke. The yacht was built *lochea* fashion, *i. e.*, a sort of combination of the modern European sailing-vessel and Chinese junk. Like all Chinese boats it was propelled, in the absence of wind, by the rotatory movement of a scull on a pivot at the stern of the boat, acting on the screw principle. The party went up the Yu Yao branch of the Yung River, as far as a town called Yu Yao, which lies on both sides of the river, and is about 40 miles from Ningpo. This voyage had been so frequently made by our gunboats, and observations as to the River Yung are so well recorded, that it was unnecessary to dwell on this part of the journey, except to mention that halfway to Yu Yao from Ningpo, on the right bank of the river, great stone-quarries exist, probably the greatest stone-quarries in China; over 1500 feet in altitude of sheer stone-mountain have been cut entirely away, caverns excavated in some places to 30 or 40 feet below water-level, and many walls of almost unfathomable depth discovered; when it is considered that all this has been done with the rudest implements, no saw ever being used, we may obtain some idea of what human industry and patience can effect, even with the smallest means. On the left bank of the river, some 3 to 4 miles inland, is the small but pretty town of Tso-chi, in which were formerly the country residences of the rich native gentry of the larger towns. These houses had originally pretty ornamental gardens and rockeries attached to them; all of these, however, were completely destroyed by the Taiping rebels, and the

work of restoration has gone on very slowly. About 10 miles up the river from the stone-quarries the party arrived at a village called Chiang-ting, where the water is quite fresh. From Chiang-ting, a branch of the Yung River flows back past the town of Tzu-chi, and from Tzu-chi the Chinese have dug a canal connecting the branch with the main river; but as at the point of junction (about 12 miles from Ningpo), the main river is salt, and as the branch river and canal are useful for purposes of irrigation, as well as for highways, a species of dam, called by the Chinese a *pa*, is put up to prevent the salt water of the river flowing into the canal, and rendering it useless for irrigation. Over these dams the Chinese cargo and passenger-boats (always flat-bottomed) are dragged by means of two windlasses, one on each side of the canal. These dams, built of flat flag-stones, are covered with a thick coat of mud, and are kept slippery by means of water; they are generally at an angle of about 30° to the horizon, and are about a foot thick at the top. The boat having been dragged to the top by a cable-line passing under its stern, overbalances itself, when the line slips, and it is allowed to rush with an extraordinary rapidity into the water on the other side. These dams are not only used for the purpose of preventing salt water flowing into the fresh canals, but also as locks when it is desirable to effect a communication between bodies of water of different altitudes. The monopoly of dragging boats over is farmed out to certain Chinese by the authorities, and the price to be charged for the service is fixed by the mandarins in conjunction with local municipal councils and trading guilds. Though these prices vary with various circumstances, the average would be about 1*d.* a ton burden for boats, and about 2*d.* a ton extra in cases where the cargo has to be transhipped, for the portorage of the goods. The windlasses are generally worked by men; one exception was known to the author where the dam being 30 feet high, bullocks and water-buffaloes perform the service.

The author continued as follows:—

Yu Yao is the furthest point reached by our gumbats. The great importance of Yu Yao consists in the fact of its being a vast cotton-market. Here we disembarked from the yacht, and took small boats roofed with bamboo-mats, to go to a place called Shan-yu, which is about 25 miles from Yu Yao. Shan-yu is celebrated from the fact of its having under the rebels been one of the cities which offered five years ago a most spirited resistance to the Imperial army under the command of Mons. Giquel, officer of the Legion of Honour, and Cooke. Here Mons. Giquel was severely wounded, and Cooke took the city and for some time commanded: this was about five years

ago, and Cooke had not been there since. It was extremely gratifying to me to observe the enthusiasm and affection with which Cooke was greeted by the inhabitants, who had neither forgotten his person nor the beneficence of his short rule over them. So strictly had he kept his soldiers in discipline, that no plunder had been committed, and now, after so long an interval, when the people knew he was in the town, they ran out to see him and to show their respect in the exaggerated Eastern fashion of prostrating themselves before him. From here we proceeded on foot to the Hsein-ku-shan, or Old Deity Hill temple, which is three miles from Shan-yu. This temple is dedicated to a deity worshipped by the Chinese before the existence of Buddhism. Michelet, in his 'Bible of Humanity,' makes the error of stating that China is an example of a nation which existed for over a thousand years without any religion whatever, until the introduction of Buddhism; and even Burnouf, careful as he generally is, accepts this statement as true without enquiry, though he owns it to be a fact that militates against all his theories on the philosophy of religion. I pointed this out to Dr. MacCartee, an American missionary of great learning, who tells me that, as the characters "Sacrifice," "Prayer," "Ghost," "Spirit," &c., occur in writings at least a thousand years anterior to the introduction of Buddhism,—that as Buddhism itself in China (modified as it has been by the ancient Chinese creeds and forms of worship) differs essentially from Buddhism in India,—he considers Michelet an untrustworthy guide in historical facts bearing on the subject.

The temple of Hsien-ku-shan has a picturesque position on the summit of a small cliff, halfway up a steep mountain, over which cliff and underneath the temple falls a pretty waterfall, which derives the water from a fall higher up the steep, flowing into and through a subterranean cavern.

At Shan-yu MM. Simon and Cooke left us, leaving Mons. Novion and myself to proceed on the journey. From Shan-yu we proceeded to *Liangwu*, the place at which we had to cross the Ngo Chiao River, which runs into the Hangchow Bay. This river has a strong tide, and is at times visited by a powerful tidal wave or *boze* (a wave resembling an earthquake-wave, which comes up strongest two days after the new moon in midsummer). Though five miles nearer the sea at Pa Kwau, there is a haul-over or *pa* from the canals on either side of the Ngo Chiao River; passengers generally find it more convenient to go by *Liangwu*, where one has to disembark, and where the arrangements made by the Chinese Transit Company are so admirable as to give very little trouble. Another reason for preferring this route is to avoid the noise,

bustle, crowding, and delays caused by the enormous goods-traffic by Pa Kwau. The instant we arrived at Liangwu sedan-chairs were brought to the boats, and a man stepped forward showing a paper setting forth that he was an employé of the Transit Company, and asked us to hand over to him the keys of our boxes, and that then we need take no trouble about them, as the Company were responsible that nothing was lost. We accordingly did as was desired of us, and jumped into the chairs provided. We were taken through about a mile and a half of mulberry-orchards, which form a belt to the right bank of the river of about 100 miles long, and from a quarter of a mile to three or four miles deep, up to the great mud embankment with which it has been necessary to protect the low-lying country from the ravages of the floods by the bore of the river. We were then shipped in our sedan-chairs into a ferry-boat, in which we crossed the river, which is here about 250 yards wide.

Shortly after starting from Liangwu we saw the commencement of the great Shao hsing Viaduct, of which the old Jesuit Fathers have given a long but inaccurate account; when I say inaccurate, I merely mean to say that they have given as its indubitable history accounts which native scholars regard as problematical. What we can ascertain with certainty is as follows: before the completion of the Chekiang sea-barrier, and before the banking of the Ngo chiao River and the Han Estuary, the whole of the now fertile lowlands of the Chekiang province was a salt-marsh (in fact it would be so again were the sea-barrier, of which I will treat farther on, removed). The first Chinese colonies which came to the province speedily occupied and built towns on the highland, among the most ancient of which were Hang chow (called by Marco Polo Cambo dan) and Shao hsing. To connect these settlements with the Ngo chiao River by a pathway, in the then absence of canals, became a necessity, hence the erection of a long bridge across the then marsh, which has been so solidly laid that it still exists. This bridge is about 90 miles long, 5 feet wide, and has a parapet remaining, in some parts of about 2 feet high. Each stone bears the date at which it was put up cut upon it; of course it may be imagined that at the present day these dates are so effaced by time that they are only legible on the more modern stones which have been used at various times for reparation. I fancied, however, that I could decypher on one stone the name of one of the emperors of the Tang dynasty. Each stone is about 12 feet long, 2 feet wide, and 1 foot thick. The pillars in the water are about 4 feet wide, thus making rectangular arches of about 8 feet span. After the

building of this bridge or viaduct the great sea-barrier of the Chekiang Province and the banks of the Ngo chiao River, &c., were completed: and there, the low-lying land being drained off, a country half as large as Holland was, by digging canals, raised gradually to an altitude, so as to give land enough to nourish a population of more than 8,000,000; and the bridge is now only used as a tow-path when the wind is dead ahead, and as a road for the few foot-passengers who do not like going by the cheap 'omnibus-boats, which start twice a day from Ningpo to Hang-chow. I may here mention that the system of omnibus-boats and transit companies, conducted on a far greater scale than is generally supposed, is almost universal in China. The Shao hsing Viaduct runs various distances in the centre of the main canal, sometimes one mile, sometimes only a few yards, once for nearly ten miles, it is now and then lost in recovered land, sometimes it forms an embankment of the canal, and sometimes crosses it, a modern high bridge being placed in the centre. The recovered land itself looks like a series of islands; about every quarter of a mile is a fresh-water canal, in which are dozens of chain-pumps, worked by treadles, buffaloes, and hand, for the purpose of irrigation; so valuable is land about here for this cause, and by reason of the facilities of transport, that it lets, merely for the purpose of agriculture, at about 7*l.* an acre. I may here perhaps mention that the chain-pump was deemed so ingenious a contrivance by an Australian farmer who was my guest at Ningpo, that he has introduced it into his farm there.

Making a short detour from our route, which lay through Shao hsing, we visited the celebrated Yu lin or Temple of Yu, where there is a copy of the well-known Yu tablet which has caused so much discussion. Yu was the third great Emperor of China, and lived about 2300 years before Christ. His great work was the draining of the marshes of Shauhsi and Shantung, and he has by some scholars been thought to be identical with Noah.

I commenced to study the question in an historical point of view, and collected as many Chinese modern transcripts as I could. In this I was aided by the Intendant of Circuit of Ningpo and other native scholars. I found that while all Chinese writers are agreed on the form of the ancient character in the inscription, there are as many as eleven modern Chinese versions. The whole inscription contains 77 characters, on the modern rendering of 38 of these characters all the works I have seen are agreed; 39 characters are variously rendered. The Rev. Mr. Hudson and Dr. McCartee were kind enough to aid me with their more mature Chinese scholarship in writing a paper on the subject. I submitted this paper to Mr.

Goodwin, the translator of many of the Egyptian hieroglyphics, and to Mr. Medhurst, H.B.M. Consul at Shanghai. Mr. Medhurst had entirely confined himself to the philological side of the question, and I had confined myself to the historical; we both, however, had arrived at the same conclusion, viz., that the present existent inscriptions are, except in the size of the characters, fac-similes of the inscription set up by Yu over 4000 years ago. Those interested in the subject I would refer to the 'Journal of the North China Branch of the Asiatic Society for 1868,' which is now under course of publication. I had hoped to show to this Society rubbings of the inscription, but I left them in China to be photographed and published in the 'North China Asiatic Journal.' I may perhaps state that the rhythm and form of language on this inscription offers a striking resemblance to Lamech's song in the Scriptures. At the Yu lin Temple, now inhabited by myriads of bats, are said to exist relics of Yu, in the shape of his clothes, &c. When this temple was first founded is now lost in antiquity; it was rebuilt A.D. 300, 900, and 1500.

From Yu lin we proceeded to Shao hsing, a large town celebrated for its wine, made from rice, and tasting something between Hock and Amontillado. It is drunk hot.

From Shao hsing we proceeded in boat through various Chinese towns to Hsi hsing, a town on the south bank of the great Han River, about 120 miles from Ningpo. Here, as at Liangwu, we found sedan-chairs waiting us, and in which, leaving again our keys and boxes in charge of the Transit Administration, we were shipped in our chairs on board a junk or sea-going Chinese vessel; on this junk were about 80 passengers besides ourselves. When I state that 10 to 15 of these junks start every day from either shore, some idea of the greatness of the operations of the Chinese Transit Company may be imagined. As the wind was very light we took over an hour crossing the river, which is about 4 miles wide. Again, a mile and a half of shore and a mile of suburb took us to the gates of the city of Hangchow, the capital of the Chekiang Province, the Paris of the Chinese empire. Our journey was not yet over; we had still to traverse $3\frac{1}{2}$ miles of one long street filled with shops, displaying every species of gaudy merchandise, gilded shop-fronts, flowered lanterns, &c.; almost the whole way being covered by an awning of variegated gay-coloured calicoes and cotton prints, so as to keep off the heat of the sun. At last we arrived at the hospitable mansion and church of Señor Ricci, a Roman Catholic missionary, belonging to the same family as Saint Ricci, one of the celebrated fathers who went to China in the sixteenth century, and who was a minister in the court of the then Chinese emperor. After about an

hour our baggage arrived. Outside the residence of Signor Ricci at Hangchow, originally a Nestorian church, founded in the third century, is the same magnificent façade which was admired by Marco Polo. Here is a tablet recording the order of the Emperor Chia Ching to persecute and expel Christians from the empire. Of this tablet I had already made a translation, which I published with notes in the 'Journal of the North China Branch of the Asiatic Society.' The story is briefly this. The Emperor Kanghsi—called by the Chinese the Sacred Ancestor—was greatly struck by the Christian religion, and invited many of the Catholic missionaries to his court, where he employed them as architects, astronomers, chemists, &c. He also liberally subscribed towards the erection and reparation of Christian churches and cathedrals; among others, to the church at Hangchow, outside which the missionaries put a tablet, stating it was built by Imperial order. Chia Ching, on the other hand, hated the Christian religion, on the score, it is said, of personal pique; as when he was heir-apparent he had visited the cathedral at Peking, and the bishop who was then conducting the service continued doing so, and did not at once leave off to come forward and pay his respects to the Prince. When Chia ching therefore became emperor he banished all the missionaries to Macao, and changed their churches into temples to Chinese deities. This happened in A.D. 1736, when the tablet I mention was erected to record this fact. The inscription contains an elaborate attack on the Christian doctrines, and an accusation against the missionaries of having forged the tablet, saying the church was built by Imperial order. After the late war the French Government demanded the rendition to the Catholic missions of the land and buildings of which they had then been deprived. Among those thus rendered was the church at Hangchow, which has now been restored from a temple to the Empress of Heaven to a Christian place of worship. The authorities offered at the time to remove the insulting inscription, but M^{onsieur} de la Place, then Bishop of Che kiang, preferred to have it left outside the church.

Père Ricci was kind enough to show us over the church and mission buildings, and our attention was attracted by seeing through the window an inclosure covering four or five acres covered by little tent-like cottages; we asked whether it was a camp, and he told us no, but that it was a collection of charitable buildings, erected after the retaking of the city from the rebels by a Chinese charitable society for the refuge of the blind, sick, and infirm; that it contained 200 blind men with their families, amounting to 800 souls; and that work, such as plaiting straw-mats, basket-making,

&c., was provided them; that besides these 800 there are 1200 other inmates, who are too old or infirm to work; and that a staff of 40 native doctors gave gratuitous advice and medicine to the 2000 inmates. None are allowed to be absolutely idle, but help towards their own sustenance by rearing fowls, pigs, cotton-spinning, and other light work. Sanitary regulations with regard to cleanliness, &c., are not, I regret to say, as rigorously enforced as they might be, but still this pleased me as being not only the largest in scale of all the charitable associations I have heard of in China, but also the best conducted; other charitable associations, such as that for the prevention of infanticide, the burial of the uncoffined dead, foundling institutions, and free schools, being generally more or less marred by abuses. I regret that time does not allow me to dilate further on these charitable institutions in China, as I believe their existence and working is not generally known in England.

We visited the monuments which have lately been erected to the memory of the Chinese who fell fighting against the rebels, and I trust I am not betraying diplomatic secrets in saying that the enlightened Viceroy Ma has recommended the Emperor to order a similar monument to be erected at Hangchow to the English and French who died in the Taiping war. Hangchow being nearly 200 miles distant from the nearest port, I think this fact alone proves that, though local disturbances may cause local irritation, the mass of the Chinese people and the Chinese Government are grateful for the assistance Europeans gave them in suppressing the dreadful scourge of the rebellion. At Ningpo itself one such monument already exists.

The next day I had to call on the Governor-General Li, brother of the well-known Li Fu-t'ai, under the following circumstances:—An order had lately been issued for the reparation of the great sea-barrier of the Chekiang province, to which I have before made allusion, and decreeing that all the stones that could be supplied by the stone-quarries in the province should be devoted to this purpose, and only the lesser stones sold to the general public. As a matter of form permission had to be asked for an exception in our favour. This great sea-barrier is built of large, flat flag-stones, is about 100 feet wide, and on an angle of about 15° with the horizon. The lower stones overlap the higher ones, and they are all fastened together by means of huge stone bolts with here and there iron clamps. This sea-barrier stretches right from the southern bank of the Hau estuary's river to Chinhaï, the seaport of Ningpo (Chinhaï is 13 miles distant from Ningpo). The first origin of this

sea-wall is lost in antiquity, and even the accounts of the various new modes adapted as engineering science advanced are evidently of so legendary a nature, all bordering on the miraculous intervention of the deities in answer to prayer, that I content myself with giving an account of these successive alterations, as a note to this paper, in a literal translation of the commencement of a chapter in the Chinese 'Government Gazetteer' of the Chekiang province. I may mention that Mr. Thomas Kingsmill, Corresponding Secretary of the North China Branch of the Asiatic Society (himself a civil engineer), has written many papers on this subject, which have appeared in various journals and scientific publications.

The next day Père Ricci kindly accompanied us to the West Lake, outside the city, where we enjoyed ourselves thoroughly. This spot was a favourite resort of the enlightened Emperors Kang hzi and Chien Lung, to whom there are numerous arches of triumph in the neighbourhood; on the shores of the lake is the palace of the latter—alas! now in ruins, showing that the Taipings have passed the spot; from a sixteen-sided pillar, among what were once beautiful rockeries, are taken the sixteen rubbings which I have now the honour of showing this learned Society. The writing on the one I now indicate was written for the engravers by Chien Lung himself. These rubbings represent sixteen Buddhist Lo hans, or happy saints. The West Lake itself, surrounded by hills of every form and hue, is probably one of the most romantic places in the world, studded as it is with islands, whose white marble balustrades sparkle in the sun; its clear blue waters are covered with lilies, and bristle with little minaret towers, so perforated as to reflect a double globe of light on the water. On it, too, are birds of rare plumage, water-pheasants—a bird I had never seen before, divers, dippers, teal of various kinds, with their broods of ducklings. From the sky above, hardly more blue than the water below, larks warble, from the glossy-leaved bushes on the banks the thrush joins in with his music of song, and the turtle-dove, hidden in a grove of gently waving bamboos, utters pleasant cooings. Here you may see a party of gentlemen of the black-haired race, as the Chinese love to call themselves, on pleasure bent, drinking wine and laughing over the forfeits or wrong guesses in the game of *Mora*, sitting in some bright-coloured two-storied gondola, and through the open windows showing off their clean tight silk raiment of picturesque fashion, enjoying the breeze, and now and then gazing at the scenery, with its back-ground of hills, rocks, gaudy ranges of wondrously shaped refreshment pavilions, red-walled temple, spacious palace, or lofty pagoda, which ever change their aspect as the boat

passes by some tiny promontory, or glides round an island-point. Even to us foreigners, unacquainted as we are with the legends that attach to the West Lake, the spot is one of peculiar attraction, but to the Chinese it is as a paradise, or as a garden of Eden. "He is truly happy," says the Chinese proverb, "who is born in Soochow, lives in Hangchow, and dies in Canton." 'Tis here alone almost in China that the poor mandarin, imprisoned by his dignity, and shackled by the exigencies of the deportment his countrymen consider it necessary he should adopt, is able to unbend and enjoy himself like an ordinary mortal. In every nook and corner of the lake too, in the belief of the well-read native, fairies have held their revels, and bogies and gnomes have played their pranks. In its neighbourhood among the mountains are numberless temples of the various creeds current in China, each temple having its fairy tales, which, if not very interesting to us, are at all events endless in number. While some of these temples modestly showed their bright blue and imperial yellow tiles amidst the foliage of a retired valley or hidden gorge, others proudly stand eminent on the summit of lofty peaks and overhanging precipices; others, again, halfway up the craggy steep, invite the pilgrim, wearied with the ascent up the circuitous path, and footsore with the rough hewn stones winding through the bushes, to rest in halls permeated by cooling breezes, which waft a perfume to mingle with the sweet-smelling incense of the altar, through the china-aster flowers. There, too, the traveller can slake his thirst in the icy waters of the stream which softly warbles over the pebbles by the temple; or, going a little further on, can bathe in the basin of a fall, and be inspired by the loud music of the waters dashing against the rocks. At the entrance of the West Lake is the temple of the guardian spirit of the Hangchow city, who before his soul put off the struggling coil of his human body, to be indued with the glorious spiritual body, had been a servant so faithful to his king, that when condemned on a false charge to be executed, he entreated his Majesty to slay his only son also; "for," said he, "my son's love for me will cause him to commit the crime of rebellion against the Emperor to revenge my death:" then the King slew both father and son, and after several years the truth came to light, and it was found a faithful minister had been maligned; then the King took the false accusers, man and wife, and beheaded them; and he built a temple to the faithful minister, and created him tutelary deity of Hangchow. As for his accuser, and the wife of his accuser, of them did the King make stone effigies, stript naked to the waist—as are criminals at their execution—in chains and kneeling, and he placed them in

the yard of the temple, and every man who passed this way vented ordure upon them; so that, for fear the stones should be worn away, and the advantage of the example lost to future generations, a stone palisade was put round them; yet still up to this day, after the lapse of so many centuries, through the palisade do visitors to the spot show their hatred and contempt for the effigies of the calumniators, in a manner expressive, curious, and unrefined; and so respected is the memory of the faithful minister, that even those universal destroyers, the rebels, left his temple unharmed. Another curiosity on the West Lake is the Thunder Peak Pagoda, the origin of which is connected with the following legend. A barber-boy, while walking about the shores of the West Lake, is invited by a demon, in the form of a beautiful damsel, into a palace; he naturally becomes enamoured of her and marries her. She persuades him to turn doctor, and by her skill he works most wondrous cures; he is accused of witchcraft—a crime punishable by death in China; to bribe the mandarin judges, the demon bride supplies him with large sums of money. These sums of money she has robbed, in her real demon form, of a flying dragon of the Hangchow treasury while her husband slept. This gets the hero into still further trouble, and his friends inform him that he has espoused a fiend, and persuade him, at all events, to test the fact. This he does by making her drink, without her knowledge, a consecrated wine on a high festival day, the result of which experiment is terrible. She suffers the most excruciating agonies, and resumes her hideous shape, vomiting torrents of blood over the floor. Her husband returning to the room, and finding the hideous demon where he had expected to see his lovely bride, faints away with fright. As she has no difficulty in persuading him afterwards that he has been the victim of a horrible nightmare, he restores to her his love. Till at last the Queen of Heaven interferes, and the demon bride, purified by her affection for a human being, consents to sacrifice all—even his love—for his sake, and dies, having first given birth to a son, who turns out the greatest scholar of his age. She is buried on the spot where her fairy palace stood, and, to keep her quiet in her grave, the Thunder Peak Pagoda was built over her. This, in the absence of reliable history, is the legend given by the Chinese of the Thunder Peak Pagoda which proudly lifts itself in the form of a red brick fluted pillar to the skies. Another curiosity of the West Lake consists of a perforated mountain, which seemed to my inexperienced eyes to be composed of pumice-stone. This hill, by the Chinese, is supposed to have flown to the spot where it is, in a single night and of its own volition. Time fails me to speak further of the West Lake

of Hangchow. I may mention that the Government 'Guide-Book of the Antiquities and Curiosities of the West Lake' is twice as long as Gibbon's 'Decline and Fall of Rome.' I have the honour to offer to the Society an abridged popular edition of this work.* The next day we spent in visiting the Hill of the Faithful Minister, whose history I have already recorded. This hill stands in the west corner of the city, and from it a magnificent view of the city (east to west), 30 miles in circumference, is obtained. On the north is the West Lake, on the south is the magnificent Hau River. The city has now a population of nearly a million and a half; it was said to have been nearly two millions and a half before it fell into the hands of the rebels.

The journey from Hangchow to Shanghai is only interesting as showing a vast system of tidal canals, since, as the water of the river is fresh at Shanghai, it has not been necessary to institute the system of haul-overs in the Kiangsoo province that exists in the Che-kiang province; besides this, the Kiangsoo province is almost entirely plain land. The province also shows a gradual and slow recovery to cultivation of the fertile lands of the province from the fearful desolation wrought by the rebels. In the prefecture of Chia-hsing, for instance, there were formerly more than a million souls; now there are hardly eighty thousand. On the whole way from Hangchow to Shanghai, 40 miles off, we pass through a jungle, putting up pheasants at almost every step; villages and towns, of which hardly one stone has been left on the top of the other, broken bridges, choked-up watercourses. Yet since I had been on the route two years ago, I saw a wonderful improvement, villages rebuilt on the ruins of towns, cultivation carried 15 miles further from Shanghai than before, spots of the jungle cleared, and steam-dredges deepening the blocked-up watercourses. Though restoration is being carried on as quick as is compatible with the genius of the Chinese people by the present Government, which is enlightened enough to avail itself of European science as far as the Chinese peculiar institutions and social system will permit, it will still take nearly a century to reinstate the happiness and prosperity of the period before the mad coolie Hung-hsiao-chuan persuaded a rabble of criminals that he was the Son of God and brother of Jesus Christ, and that his mission was one of plunder and destruction. On the journey, too, one meets hundreds of peasants shamefully branded on the face by the rebels with the words "runaway Taiping slave."

* Deposited in the Library of the Society.

These were the peaceful inhabitants of the country who were unable to escape from the rebels.

It is a pleasure to record the politeness, kindness, and hospitality shown to us by natives of all classes during our journey, from the Governor-General, who sent us a present of hams, fowls, ducks, &c., large enough to stock a provision-shop, to the poorest peasant, who offered us a portion of his frugal meal of rice and sauer kraut. I cannot avoid thinking that, as all wars and national hatreds are caused by peoples' misunderstanding or not knowing each other, the policy of the late Sir Frederic Bruce was a most enlightened one, in making us known to the people of Chekiang and Kiangsoo by aiding with our arms to put down the most horrible rebellion that probably ever existed. No wonder that when the Chinese armies were led to victory by such a chivalrous and disinterested Christian gentleman as Colonel Gordon, who used the victories he gained to inculcate, as far as he could, mercy and humanity to the misguided vanquished in the minds of the angry authorities,—no wonder that these Englishmen should be well received. These two provinces, inhabited by 60,000,000 of human beings, have brought us a rich national reward in the shape of a gradually increasing trade, a growing market for our manufactures, and consequent employment for thousands of our countrymen.

THE PRESIDENT observed that any experienced traveller, who also possessed the qualifications of a good scholar, might be proud of the paper which had been communicated to them by so young a gentleman as Mr. Gardner. He was informed that Mr. Gardner was a skilled Chinese scholar, and the research he had made was evident from the contents of the paper. He must express his great admiration for a young man of so much talent and research, and he would beg of him to come forward and say a few words on the country which he had described.

MR. CHRISTOPHER GARDOXER said he would only call attention to the series of portraits on the wall, which were taken from the sixteen-sided pillar in the Emperor's palace at Hangchow. The inscription on one of them was written for the engraver on the stone by the Emperor himself. Some of the characters are very like Sanscrit, but he believed they were Thibetian. It was interesting, because in the Buddhist temples one often came across Sanscrit works, not only the translations but the originals as well. There was a little island to the east of Chusan, which was a sort of Chinese Athos; it was full of Buddhist priests. The portraits were the portraits of devotees who had attained to the highest rank in the Buddhist religion.

Tenth Meeting, 12th April, 1869.

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT, in the Chair.

PRESENTATIONS.—*Frederick Fitch, Esq.*; *Col. Barnett Ford*; *William Clark, Esq.*

ELECTIONS.—*Frederick George Chincock, Esq.*; *Frederick H. Leaf, Esq.*; *Roger Leigh, Esq.*; *E. B. Murch, Esq.*; *E. M. Underdown, Esq.*; *Charles M. T. Western, Esq.*; *Rev. T. G. Wilson, B.A.*

ACCESSIONS TO THE LIBRARY SINCE THE LAST MEETING OF MARCH 22ND:—*'Narrative of the British Mission to King Theodore.'* By Hormuzd Rassam. Presented by the Author. *'Historia del Peru Independiente.'* Por Mariano Felipe Paz Soldan. Presented by the Author. Four volumes of Chinese works relating to Antiquities and Natural Curiosities of the West Lake, Hangchow. Presented by C. T. Gardner, Esq. *'The Highlands of Brazil.'* By Capt. R. F. Burton. Purchased.

ACCESSIONS TO THE MAP-ROOM SINCE THE LAST MEETING:—A Map of Abyssinia, showing the Route of the British Mission under Mr. H. Rassam, &c., from Massowah to Magdala. Compiled and presented by G. P. Badger, Esq., F.R.G.S. *Turkistan*, with the adjoining Portions of the British and Russian Territories. On four sheets. Compiled by Lieut.-Col. J. T. Walker, R.E., Superintendent of G.T.S. of India. Presented by the India Office, through C. R. Markham, Esq. Map, showing the Route-survey from Nepal to Lhasa, and thence through the Upper Valley of the Brahmaputra. By a Pundit. Compiled by Capt. T. G. Montgomerie, R.E. Ordnance Survey. (191 sheets.) Presented by Sir H. James, R.E., Director of the Ordnance Survey.

The following Papers were read:—

- 1.—*Report of the Trans-Himalayan Explorations during 1867.* By Captain T. G. MONTGOMERIE, R.E., of the G. T. Survey, from the original Journals, &c., of the Trans-Himalayan Exploring Parties.

[ABRIDGMENT.]

THE Trans-Himalayan explorations made during 1865-6, from the Mansarowar Lake to Lhasa, supplied various pieces of information as to routes and places in Tibet, of which the names were unknown in India. Tibetans had been heard to talk of their gold-mines and

salt-mines, and the position of some of the latter was indicated roughly on European maps, but our knowledge of all such places was vague in the extreme, though the Tibetans certainly do bring both gold and salt. The first Pundit heard of these places whilst in Lhasa, and the second Pundit, when at the Gartok fair, heard various particulars from which he gathered that the route to those gold-fields east of Gartok was feasible.

It will be remembered that the second Pundit made his way to Gartok, in 1865, by one route and returned by another, thus connecting that place with points in British territory on the south that had been fixed by regular survey. There, however, still remained a large gap between Gartok and the Ladak territory, which latter had also been surveyed. It appeared to me very desirable that this gap should be filled up, the more especially as it embraced a portion of what was said to be the course of the great River Indus; a portion, moreover, that had never been traversed by any European.

The natives pointed out the position where the eastern branch came in, and a gap seen in the mountains in that direction made its existence highly probable. Having this information, it seemed to me very desirable that the question as to the existence or non-existence of this branch should be settled. I consequently determined that the second expedition of the Pundits should be in that direction, the object being to settle various doubtful points as to the position of the upper basin of the Sutlej; the second object, the question of the eastern branch of the Indus; the third, the connection of Gartok with the regular survey in Ladak: and the fourth, to explore up to the gold and salt mines east of Gartok, and as far beyond as the Pundits could get in an easterly direction. The latter being with a view to gain some knowledge of the vast *terra incognita* lying between the desert of Gobi and Lhasa. Preparations for the expedition were made during the spring of 1867; a third Pundit was entertained and trained to supplement the place of the second Pundit, who had proved to be somewhat wanting in nerve. Starting from Mussoorie, on the 2nd of May, the party under the first Pundit reached Badrinath on the 24th of May, and Mana on the 3rd June. The Mana Pass, to the north, had not been declared open, and the party had consequently to wait at Mana. Whilst there, several heavy falls of snow occurred on the neighbouring mountains.

The Pundit found that before his party could cross into Tibet it was necessary that the opening of the pass should be formally notified by the Tibetan officials, and before this is done the Jongpon (or Zangpon) of Chaprang makes enquiry every year as to the political and sanitary condition of Hindustan. The enquiry seems

to be carried out with all that assumption of lofty superiority for which Chinese officials are famous. Looking down from their elevated plateaux, they decide as to whether Hindustan is a fit country to have intercourse with. The decision come to appears not to be at all a dead letter, for, as will be seen hereafter, it ultimately affected the Pundit's movements not a little. The especial enquiries made are, as to whether there is war, epidemic, famine, &c., such as are in any way likely to affect Tibet.

At length, on the 9th of July, three men, sent by the Jongpon of Chuprang, arrived, and having made all their enquiries, declared the Mana Pass open to traders from Gushwal; the party accordingly was able to commence its march on the 26th July. It consisted of eleven men, twelve asses, and one pony; the men being all armed with weapons they had borrowed at Badrinath, as they were told that arms would be required to keep off robbers. On the 28th they crossed the Himalayas by the Mana Pass (18,570 feet), and on the 29th July reached Lumarti Camp. Here they were told to halt until more traders joined them, so that the Tibetan officials might be saved trouble by examining and taxing a number at the same time. The second Pundit, however, was sent on ahead to intercede with the Chuprang Jongpon, and he succeeded in getting authority for the party to advance alone. Churkong is the place where traders are generally taxed, but in this instance the examination was made at Barku. The Abtuk of Chuprang searched the baggage, fortunately without discovering the instruments, and, being satisfied that the party was a trading one, he levied the taxes at the usual rates.

On the 6th August the party reached Totling, passing the small town of Chuprang on their left (north). From Totling the party advanced direct towards Gartok, crossing the Sutlej by a remarkable iron suspension-bridge 76 feet span, 7 feet wide and about 40 feet above the water. The chains are formed by links of iron of the shape of the figure 8, each about one foot in length, the iron being over one inch square. The bridge is said to have been built by Gyalpo Kesar, or Sekundar Badshah (Alexander the Great)! The iron is in capital preservation, owing to the very small rainfall, and to the care with which it is annually lubricated with butter (ghisee).

On the 9th August they crossed the watershed between the Sutlej and the Indus, by the Bogola Pass, 19,220 feet above the sea, and reached Gugti Camp, close to Gartok, on the 11th instant, avoiding the latter place, lest its officials should in any way interfere with their onward progress. Continuing their journey, they ascended

the mountains east of Gartok, and, after crossing the Gugti-la Pass, 19,500 feet above the sea, they found themselves, on the 14th August, in a vast desolate plateau, the lowest points of which they ascertained to be 15,280 feet above the sea.

On the 10th they crossed the Pabba-la, 17,650 feet above the sea, and descended to the Giachuruff Camp, on the banks of the Singhi-chu, or Indus River, 15,700 feet. After the desolate and arid table-land they had crossed, the sight of the river and its fresh water, and of the large camp beyond, was at first very pleasant to the Pundit's party; their pleasure was, however, soon damped, as they found the inhabitants of the camp very suspicious as to the object of their journey; their progress being for the first time impeded by the officials. Gopa Tajani, the head man, questioned them as to the objects of their journey, and as to who and what they were, &c. When told that they were Bisáhiris, who had come there solely to sell coral and purchase shawl-wool (*pushum*) in exchange, he told them flatly that he did not believe their story. With great correctness he then proceeded to point out the proper country of each individual, and said that if they had been really all Bisáhiris, and had been lately in Bisáhir, they would never have dared to enter Nari Khoreum that year, as an order had been promulgated, at the time of opening the passes, forbidding Bisáhiris to enter the country on any account, as they had in the previous year introduced small-pox, which proved fatal to many of the inhabitants. The head man, moreover, hinted that the party had introduced Europeans into the country.

The Pundit thought these suspicions were due to the jealousy of an acquaintance of his who lived near Badrinath. However, by repeated protestations, he managed to bring the head man round to a partial belief in their story, so that he at last consented to allow a portion of the party to proceed onwards, provided the remaining portion was left as a hostage for their good faith.

As the second Pundit's nerves were again considerably shaken by the dreary mountains they had crossed, and by the check they had received, the first Pundit decided to leave him at Giachuruff whilst he and the third Pundit pushed on ahead on the pretence of selling their coral. Whilst preparations for this purpose were being made the head man's suspicions began to gather again, and it was only after further entreaties, accompanied by presents, that they were allowed to advance. The Pundit left the Giachuruff Camp, on the 22nd August, with the third Pundit; but the latter was, very soon after starting, detached with one servant to carry a route-survey up the river Indus as far as he could get. The Pundit himself made a

very long march, so as to get well clear of the Giachuruff people, and by night was far away to the east, resting near the bed of a small dry stream. On the 23rd August he hoped to have been able to cross the Chomorang Range, but, owing to a very heavy fall of snow, he was obliged to halt at a camping-place below it. Snow continued to fall on the 24th and 25th, and he was not able to continue his march till the 26th August, when he crossed the Chomorang-la Pass, 18,760 feet above the sea, and after a very long march, crossing a good deal of snow, he reached the large camp of Thok-Jalung,* the chief gold-field of that part of the country.

As the Pundit descended the Chomorang-la Pass, the Thok-Jalung Camp came in sight: he found it pitched in a large desolate plain, of which the prevailing colour was reddish brown. As far as he could see, it at first appeared to be like other Tibetan standing camps, except that it was very much larger. As he got closer he made out the noise of a great number of voices singing together, and, on his arrival, found that this came from the gold-diggers and their families whilst the men were at work.

The Pundit had armed himself with a letter from the Giachuruff Chief, and this he presented the next day to the Thok-Jalung Chief with a small present of the best Indian tobacco, which he had somehow discovered to be a particular weakness of that individual. The Chief received the Pundit in his large tent; he was much gratified by the present, but, in spite of that and the letter, it was evident, from his manner, that he did not think that matters were quite right. He cross-questioned the Pundit, and then advised him to do what he had to do in Thok-Jalung quickly and to return to Giachuruff by the same road as he came. The Chief said that it was out of his power to allow the Pundit to stay long, and that properly he ought to have sent him back at once, as there was an order in force forbidding all Bisahiris to enter the country that year.

The Chief was an inhabitant of Lhasa, called Yoodak Mingmâr, about 45 years of age. He had been master of the Thok-Jalung gold-field for some time. The Pundit saw him several times afterwards, and always found him very civil. His usual dress was a red robe of Lhasa or Shigatze manufacture; his head was covered with a brown felt hat of Chinese fashion, with a broad rim turned up all round. He told the Pundit that he and every one else wore furs in the winter, and that they could not live at that season without them; which is no doubt correct, as the Pundit's observations make the gold-field to be at the great altitude of 16,330 feet above

* Latitude, π . $32^{\circ} 24' 26'' 5''$, longitude $81^{\circ} 31' 38''$.

the sea. His tent was a large circular one, about 25 feet in diameter, with two poles; it was pitched in a wide pit, some 7 or 8 feet below the surface of the ground, and the descent to it was by means of steps. Outside, the Pundit noticed one of the gigantic black dogs of Lhasa; this beast was tied unpleasantly near the door, and was so savage that there was great difficulty in preventing him from flying on strangers. The Pundit had seen many of these dogs in Lhasa, and he at once recognised it by its great size, deep jaws, and the white mark on its chest. The Lhasa people call them Gya-ki or "royal dogs."

The tent was made of black yak's hair; it contained bales of shawl-wool (pushm), leather, packages of tea, strings of dried beef from the yak, and a few other Tibetan luxuries, such as dried apricots, currants, &c.; the poles were garnished with several matchlocks and a sword. The Chief's seat was beside a small box, in which there was a drawer containing paper, pen, ink, and a couple of cups or bowls, one for drinking tea and the other for chung or whisky. The Chief's tent seems to have also been the shrine of the camp, as behind his seat there were piled up the usual images, small brass bells, tiny vases, books, pictures, lights, &c., that are carried about by wandering Buddhist Lamas. Whether the Chief was also a Lama was not ascertained, but his red dress and the ritualistic instruments point to that conclusion.

The Chief was constantly smoking a silver-mounted Nepalese hookah. Tea was forthcoming at all hours. He had about ten personal servants, who lived in small tents round about his own. The Chief was a very intelligent man, and, all things considered, the Pundit thought him well informed. His shrewdness there was no mistaking, as instanced in the matter of the coral. He noticed the Pundit's box, examined it carefully, and then asked him how he came to have such a good box. The Pundit was fortunately ready with his answer, and said he bought it at one of the "Saheb logues" auctions, to carry his coral in. The fame of these auctions had reached even this Tibetan Chief, and he expressed himself as quite satisfied, allowing the box to be removed without discovering the large sextant which was stowed away in a secret compartment. The Chief took a great liking to the Pundit, and used to send for him every now and then, in order to discuss, over tea and tobacco, the great country down below.

The Pundit found the part of the gold-field that was being worked to be a great excavation from 10 to 200 paces in width, and some 25 feet in depth, access to the bottom being by means of steps and slopes, the earth as dug out being thrown upon either side.

The excavation at the time of the Pundit's visit was about a mile in length. The digging is carried on with a long-handled kind of spade, and occasionally with an iron hoe; the iron for these implements is brought from Bisshir, Ladak, &c. The camp had a blacksmith who could repair these tools.

A very small stream runs through the gold-field, and the bottom of the excavation is consequently rather a quagmire during the day-time; but the stream is put to good use for washing the gold out of the soil. The diggers dam up the water, and leave a sloping channel for it to escape by. A cloth is spread at the bottom of the channel, and kept down by a number of stones so as to make the bottom uneven. One man brings earth from the excavation and sprinkles it over the channel, whilst another man drives water down the channel by means of a leather bag. The water carries the lighter soil right away, but the pieces of gold fall into the uneven places, and are easily collected in the cloth by lifting up the stones. The yield of gold seems to be large, and the "finds" are occasionally very heavy—the Pundit saw one nugget of about 2 lbs. weight (75 tolahs). The diggers say they can recognise the soil that contains gold at once, but, judging from the large number of gold-fields that have been used at one time around Thok-Jalung, and are now more or less abandoned, the Tibetan gold-diggers seem to be quite as capricious as those of Australia or California; and the probability is that, whenever they are a long time without getting good finds, they strike their camp and move off to what they think a more tempting field.

From what the Pundit heard during this last expedition and the previous one to Lhasa, there is a whole string of gold-fields extending all the way from Lhasa to Budok, along the route which must run close to the northern watershed of the Brahmaputra, probably in the depression to the north of it. The gold-fields are carefully watched by the Lhasa authorities, a gold commissioner, called Sarpon, superintends the whole of them, and each field has a separate master. Any individual is allowed to dig, provided he pays the annual tax of one sarshoo weight of gold, which is about half a tolah, or two-fifths of an ounce. The greater part of the diggers come from the Chung province around Shigatse. The gold commissioner makes an annual tour through the gold district, visiting each field and collecting the taxes.

The Pundit says that in all his travels he never experienced such intense cold as he did at Thok-Jalung, owing, as he thought, to the high cold wind that was always blowing, more than to the great elevation, viz., 16,330 feet above the sea. The tents of the diggers

are always pitched in pits, some 7 or 8 feet below the surface of the ground, so as to keep out the wind. Spite of the cold, the diggers prefer working in the winter, and the number of their tents, which in summer amounts to 300, rises to nearly 600 in winter. They prefer the winter, as the frozen soil then stands well, and is not likely to trouble them much by falling in.

The water near Thok-Jalung is so brackish that the diggers cannot drink it till it has been frozen and then re-melted. Considering these difficulties about water, the great elevation, the total absence of wood, and the general severity of the climate, gold-digging at Thok-Jalung is carried on under very much greater difficulties than in any other part of the world. Nevertheless the diggers appeared to be cheerful and were constantly singing, their families joining in a sort of chorus, which could be heard at a great distance.

Argols of dried dung from the yaks, ponies, and sheep, &c., form the only fuel. The Tibetans cook and eat three times a day, their food consisting chiefly of boiled meat, barley-cakes, butter-milk, and tea stewed with butter. The Pundit said the Tibetans all preferred China tea, and did not approve of Himalayan tea, spite of its price; they vowed the latter was too heating for them, and that only very poor folks take it.

The Pundit mixed freely with the gold-diggers, and observed all their ways and habits, but his time was limited; the Chief, spite of his friendly conduct, insisting that he could not let him stay beyond the 31st of August. He ascertained that the price of the gold at Thok-Jalung was only 5½ to 6 rupees in silver per saishoo (which weighs about a half-tolah and 8 ruttees), or rather less than 30 rupees per ounce. There were two tents belonging to goldsmiths in the camp, they came from the Chung or Shigatso province. Seeing no chance of extending his journey to the east of Thok-Jalung, the Pundit retraced his route to Giachuruff; there he found the third Pundit, who had made his way for a considerable distance up the River Indus to a place called Jiachan.

Though the third Pundit had heard that a large band of mounted robbers were wandering about the Upper Indus, he was in no way hindered by them till he reached Jiachan. There, however, whilst he was down at the river, a couple of armed robbers fell upon his servant, an oldish man, and knocked him over, seizing a thermometer and the cocoa-nut containing the supply of quicksilver. Fortunately the Pundit was not far away, and, hearing the cries, he rushed to the rescue. Seizing one of the robbers by his pig-tail, he swung him round and took back the stolen things. This third Pundit, being a tall, powerful man, completely turned the tables,

and the robbers pretended that they had only been joking with the old man, and did not really mean to take anything. The robbers made off as soon as they could, and the third Pundit, thinking they might bring down more of their brethren on him, decided to retrace his steps. He was very reluctant to do this, as, from all he could hear, three or four marches more, at the outside, would have taken him to the source of the Indus, which at the farthest point he visited was still a good-sized stream. He was, however, certain, from the peculiar head-dress of the robbers, that they belonged to the armed band he had been warned against—the head-dress being one peculiar to the nomadic inhabitants of the Shellfuk and Majin districts, who are noted as professional robbers.

The whole of the Pundit's party having been recollected at Giachuraff, he decided to trace the Indus down to its junction with the river upon which Gartok stands. Starting on the 4th September, they marched steadily down stream, passing numerous camps with their flocks and herds, but seeing no cultivation or villages till the 7th, when they came to a small village with the first patch of cultivation. All along the banks there was a low bushy jungle. The grass appears to have been abundant, and near one camp there was a herd of five or six hundred horses or large ponies running almost wild, mostly of a white or a greyish colour. On the 12th September they reached the junction of the Indus and Gartok rivers, and, crossing the latter, encamped near the Lujan-Chumik spring.

From Lujan-Chumik the Pundit sent the third Pundit to trace the river down into the Ladak territory, whilst he traced it up to Gartok. On the 14th September he reached Gargunsa, the winter residence of the Gartok authorities. He found only three large and eight small houses in it, and was informed that the rest of the inhabitants lived in tents. All along the banks of the river he found the grass tall and luxuriant. The valley all the way up was flat and wide.

On the 16th September the Pundit reached Gartok, where he found a camp of about 200 tents, mostly belonging to traders. On his arrival, he was alarmed to find that some one had been spreading reports as to his being in British employment, and he found it advisable to hasten his return. Choosing a new route, he got separated from his baggage and the greater part of his party; and had he not fallen in with traders from Shipki, he would have been put to very great hardships. He crossed by the Laochia Pass, and, marching by Shiang and Dunkhar, reached Totling on the 26th of September. Here they waited for the third Pundit, who joined

them on the 29th of September, after having traced the Indus down to Demchok in Ladak. From Demchok he crossed from the basin of the Indus to that of the Sutlej by a very high pass, and carried a route-survey down to Totling. From Totling the second and third Pundits were sent down the Sutlej to Shipki, tracing the river as closely as they could. From Shipki they carried a route-survey in a southerly direction, crossing the Himalayas by a high pass, and descending to Nilung on the upper course of the Ganges.

The Pundit himself returned from Totling to Badrinath by nearly the same route as he advanced by, only making one small variation. Ultimately the second and third Pundits rejoined the first, and they all made their way down into British territory by the beginning of November.

The geographical results of the exploration can be seen at a glance from the accompanying map. They account for the geography of about 18,000 square miles, founded on 850 miles of route-survey, with 80 heights. The routes are checked by 190 latitude observations taken at 75 different points.

The course of the Sutlej River has been roughly traced from Totling down to Shipki, on the border of British territory. Hitherto there has been no survey of any kind of this portion; and the route, though only actually touching the river for a short distance, was carried near enough to it to enable the Pundits to lay down its probable course very closely. The position of Gartok, as determined by the two routes of the last expedition, has been confirmed by a third route carried up from Badrinath. The mean of three gives a very good longitude of Gartok,* as has been proved by the further route-survey carried from Gartok to Demchok, which latter had been previously fixed by the regular survey operations in Ladak. The longitude by the route-survey only differing from that of the regular survey by 24 minutes—a very satisfactory result from a route-survey† traversing 160 miles direct over such a very rough tract of mountains.

* Longitude, $\text{E. } 86^{\circ} 23' 33''$; latitude, $\text{N. } 31^{\circ} 44' 4''$, and height 14,250 feet above sea.—T. G. M.

† The values of the pass, as tested by the differences of latitude, were very accordant, thus:—

	Difference latitude	Deduced length of pass in feet.	REMARKS.
From Badrinath to Gartok ..	0 59 36	2495	By 1st Pundit.
„ Gartok to Thok-Jalung ..	0 40 23	2512	„ 1st Pundit.
„ Gartok to Demchok ..	0 57 17	2534	„ 1st and 3rd Pundits.
„ Demchok to Totling ..	1 13 24	2465	„ 3rd Pundit.

The routes have also defined the courses of both the upper branches of the River Indus from near their sources to their junction and the conjoint stream from that point into Ladak. Neither of these branches had been previously surveyed in any way, except a small portion of the Gartok branch above Gartok, which had been roughly laid down by Moorcroft.

The existence of the eastern branch was doubted by many geographers,* as no Europeans had ever seen it. The Pundit's route has now proved that this eastern branch is the main stream known to the natives as Singh-gi-Chu or Singh-gi-Khamba (Lion's Mouth), the River Indus itself; whilst the other branch, hitherto generally supposed to have been the main stream, is much smaller than the eastern one, and invariably called the Garjung-Chu.

The routes extended beyond the eastern watershed of the Indus as far as the great Thok-Jalung or Thok-Samba gold-field. Thok-Jalung was, moreover, roughly connected with various other gold-fields and salt-mines, by means of information derived from travellers; and the general correctness of this information was roughly established by a route to Rudok, derived from similar information, which made out the position of that place tolerably close to that determined by the regular survey.

A number of lofty snowy peaks were determined from various stations of the route-survey, the most remarkable being the Aling-Gangri group north of the Indus, which, judging from the great mass of snow seen on the southern face during August and September, must be upwards of 23,000 feet above the sea—possibly as much as 24,000 feet. The line of perpetual snow on the southern slopes of the Ladak Mountains approximates to 20,000 feet in the same latitude; and it would require several thousand feet of snow above that line in order to be very imposing at 80 miles, at which distance the Pundit first saw it. The Aling-Gangri group had never, as far as I am aware, been heard of before. They appear to be a continuation of the range between the Indus and Pangkong Lake. The Pundit could see no farther continuation of the range to the east of Thok-Jalung. Another high group was seen to the east of the Medok-la, on the watershed between the Sutlej and Indus.

Altogether the Pundit and his brethren have, as I predicted, improved very much in the art of fixing distant peaks. Satisfactory proof of this has been forthcoming from their back bearings to well-

* It was indicated from native information by H. Strachey, on his Map of Ladak and Gair-Khorum.

known peaks,—such as Leo-Porgyal, Kamet, &c., which gave very accurate positions to those peaks—forming at the same time a valuable check on the route-surveys, and proving that there has been no large accumulation of error.

The numerous heights determined by the boiling-point give a good idea of the great elevation of the country traversed, and the consequently enormous difficulties under which the route-surveys were made. From them it will be seen that the Pundits were for more than three months at an elevation of over 13,000 feet. They crossed the great range between the Sutlej and the Indus three times—that between Gartok and Chajothol once, between Chajothol and Giachuruff once, the Chomoring range twice, and the Himalaya range three times, each of the crossings involving a pass of over 17,000 feet, two of them being over 19,000 feet.

The height of Gartok by the above is only 14,250 feet, instead of 15,000, as had previously been assigned to it. At the several points—Totling, &c., where Henry Strachey's heights were taken—the Pundit's heights are generally lower. A difference in the same direction was noted in the results of the previous expedition, at a point near the Mansarowar Lake; and, judging from the following comparisons, it appears to arise from a constant difference, probably due to the thermometer employed:—

	By the G. T. Survey.	By H. Strachey.
	Feet.	Feet.
Huale	14,276	14,500
Pangkong	13,936	14,500
Tangse	12,791	13,000
Diskit	9,959	10,400

The above shows that Captain H. Strachey's were generally higher than the Great Trigonometrical Survey values, by about 300 feet on the average; and the Pundit's values differing from Captain Strachey's by about the same amount, it may be concluded that they are tolerably near the mark, and at any rate not in excess.

The actual source of the eastern branch or main stream of the Indus was not reached; but the people between Giachuruff and Jiachan said it rose at a place called Gangri-Georgiap, which may perhaps refer to the Gangri or Kailas Peak; but the direction of the course of the Indus, as seen from near Jiachan, pointed rather to the east of that mountain. The whole district along the upper course of the Indus is called Bongthol, which is divided into the small districts (puttees) of the Singhtod and the Singhmet—"Tod" signifying upper, and "Met" lower.

At the highest point visited, the Indus was still a considerable stream. At Giachuruff the ford was always a difficult one; and for

eight days after the fall of snow the Pundit experienced, the river was not fordable in any way. While it was snowing on the Chomorang range, heavy rain fell at Giachuruff, and the river consequently rose very much. The stream was generally very clear, and full of fish* of all sizes, up to about 18 inches in length.

From Jiachan to Giachuruff the Indus flows through a rather broad, flat valley; and from Giachuruff to its junction with the Gartung-Chu it flows through a similar valley, the banks being lined in many places with long patches of low jungle. The Indus above the junction was from 100 to 200 paces in breadth, with a depth of 6 to 4 feet; while the Gartung-Chu was in places as much as 250 paces in width, but with a depth of only 1 to 2 feet. The Gartung-Chu, between Gartok and the junction, flows through a particularly broad and flat valley. The Indus below the junction flows through a wide valley to a considerable distance below Demchok.

When at Thok-Jalung, the Pundit made diligent enquiry as to the adjacent countries; he was informed that a large district, called Majin, extended for nine days' journey to the east, and that a smaller district, called Shellifuk, lay to the south-east. The Majin country was said to be a difficult one to travel in, as no rivers ran through it. The Shellifuk district boasted of some streams, but they all run into a large inland lake.

Immediately to the north of the gold-fields there is no regularly inhabited country, as far as the Thok-Jalung people are aware. They say there are some wandering thieves—Champas, or Khampas—who live entirely on meat, and have had so little acquaintance with grain in any shape, that they get sick when they take it from their more southerly brethren. The Pundit, however, seemed to have very little faith in this part of the story. We heard that at a considerable distance to the north-east there was a tract called the Whor country, inhabited by Shakpo people—the same style of people as those who come from Jilung.† Tartary is said to be to the north-east of Whor. To the north-west of Thok-Jalung lies Rudok, the route to which has been roughly indicated on the accompanying map. Ting-Chu and Rawung are the intermediate districts; the first is a very cold place, and has very little sweet water, though plenty of brackish water. Rawung has much the same climate as Rudok, only slightly colder; it has, however, plenty of fresh water.

* The Dokpa people eat these fish, but those Tibetans who have read Buddhist books do not do so.

† About one month north of Lhasa.

There is said to be a direct route from Thok-Jalung, south-east to Tadam Monastery, on the great Gartok and Lhasa road. This route crosses some comparatively low ranges, but is said generally to run over great plains. Such inhabitants as there may be on the north, east, and south are all nomadic, living in standing camps, shifting every now and then according to the state of the pasture, time of the year, &c. They are almost all addicted to highway robbery.

I have already pointed out how well the Pandits have succeeded in the difficult art of intersecting and fixing distant peaks. The way in which the chief Pandit quartered his ground and divided it, so as to account for the geography of the whole, with a few routes, is another great improvement; their work covering a much greater breadth, and leaving very little doubt as to the position of the intermediate ranges. As before, the chief Pandit showed great tact in making his way among strangers; and his conduct of the whole expedition is highly creditable; and the way in which he has carried out my instructions is deserving of all praise.

The memoir will be printed entire in the 'Journal,' vol. xxxix.

The PANDIT remarked that the communication just read was a production of which Captain Montgomerie had every reason to be proud. These Pandits had been trained to penetrate these difficult countries, acquiring the languages, and being instructed how to make observations, which rendered their journeys of high scientific value. Many persons were not fully aware of the great dangers these people had to encounter. They travelled at the risk of their lives every moment; for if one of the scientific instruments which they possessed had been detected in their boxes, they would have been put to death. Animated by an *esprit de corps*, and a love for science, these Pandits had been able to traverse the country where no European would be safe, and to make a series of observations for latitude and longitude, and to determine the height of a great many mountains, approximately, 3000 feet higher than Mont Blanc. He had much pleasure in making these observations, because he saw in front of him two distinguished Indian authorities—Sir Robert Montgomerie, without whose countenance, in the first instance, Captain Montgomerie could not have carried out his novel project, and the ex-Governor-General of India, Lord Lawrence, who had assented to the arrangements made by Captain Montgomerie. The results were most gratifying to every geographer.

SIR HENRY RAWLINSON believed he was only expressing the feeling of all geographers in saying how deeply they were indebted to Captain Montgomerie for having devised and executed this system of exploration by native agents; because it was owing to that system alone that we had succeeded, and should in future succeed, in gaining a knowledge of the territories beyond the northern frontier of India, because they were utterly inaccessible to European travellers. Sir Roderick had drawn attention to the value of these discoveries. It was certainly of the greatest importance to remember that at last we had penetrated beyond the great elevated plateau which bounded India to the north. The Pandits had ascended the Himalayas, and had gone straight across to the outer crest, and descended to the lower plateaux of Tartary—the gold-

fields being really beyond the western frontier of Thibet. It was curious to find that there was not only a single gold-field, but a succession of gold-fields, extending the whole way from Budok to Lhasa, along the range; and there was reason to believe that gold-fields continued in the same direction as far to the north-west as Ilich. This was the central part of the gold of Central Asia. The officer formerly employed by the Chinese Government to superintend the collection of this metal used to reside at Ilich, and to send the people down into this district. We did not know how far they went; but we knew that the gold-diggers resorted to a place about 100 miles to the south-east of Ilich, and obtained the gold along this range, so we had fair ground for believing that the gold-fields extended from Lhasa, along the foot of that range, for a distance probably of nearly 1000 miles in a direction north-west and south-east. It had been noticed by a writer in the public press, that we really had an account of these gold-fields in the most ancient times, because there seemed hardly any doubt that the gold-diggings described by the Pandits were the very same which attracted the notice of Herodotus. He described them in words which were singularly applicable. He told us that there was a wild country to the north of Cashmere—Cashmere in a broad sense including all Thibet; and that the gold was found there by "ants," whom he described as burrowing underground, just in the same way as these people were described by the Pandits, as making subterranean dwellings by throwing up the earth into heaps, and in the earth the gold was found. Then, he said, the Indians from Cashmere came very often to try and get gold, upon which the ants sallied out, and if they caught any person they ate him up, there being no hope of escape from the ants. Now, in the early history of Asia, it was usual to call races and tribes after certain animals: thus we heard of the "snakes," the "horses," the "wolves," "dogs," "lions," and "foxes." He believed that the race who then inhabited the gold district of Thibet were called "ants." It seemed to him that that was the real explanation of the statement of Herodotus. Again, their peculiarly crouching attitude, which Captain Montgomerie described, might have had something to do with suggesting the cognomen of "ants." There was only one other point which he would notice. In giving every possible credit to the Pandits, we must remember that this was not entirely a new country. The portion from Gartok to the north-east was entirely new; but Moorcroft and Henry Strachey had both been up the Indus as far as Gartok. Strachey there heard of the other branch of the Indus now discovered by the Pandits, but he was unable to penetrate into Independent Thibet. He believed, in fact, it was quite impossible for any European traveller to penetrate into that country. He trusted the future explorations of the Pandits would be equally successful; and that they would be able to clear up the question as to the existence of an ancient royal road from Hindostan to Central Asia. Moorcroft told us, that having crossed a native path between the Sulaj and Gartok, he discovered the traces of a large, wide, paved royal road; that in the plains it was paved, and in the hills excavated through the mountains; he understood it went along the Indus to Budok, and from that point passed round the Kuen-luen hills into the plains of Tartary. A mission to discover this royal road would be a grand expedition for the Pandits; and he hoped Captain Montgomerie would be induced to send them in that direction next season. It would be very desirable, for the purposes of trade, to know the exact line which that road followed, because we might be quite certain that if such a line did exist under the Moguls, it could be opened out again with infinitely better results than were accomplished at that time.

SIR ROBERT MONTGOMERY said, with reference to the royal road mentioned by Sir Henry Bawlinson, he knew it was generally supposed that there was a royal road extending from Lhasa to Ilich. Some of the members of the

Society might remember that, in 1854, Lord Dalhousie tried to make a road from Simla towards Gartok, with the object of opening an overland route to China from India. But the road was not carried on, partly on account of the want of funds, and for other reasons. When he was in the Punjab he endeavoured to continue the road, the object being to strike the royal road between Lhasa and Heli, so as to enable traffic to come direct from China to India, avoiding the roundabout course through Ladak and Cashmere, and thus turn the flank of Cashmere, and so escape the heavy duties which were levied on goods coming through that country. The road was not completed, and still remains unfinished, for want of funds; but three-fourths of it have been made between Simla and Gartok. As time passed, they hoped to get funds sufficient to complete the road; and he thought the recent discovery of the Pundits would induce the authorities to go on with that road. The President had kindly credited him with having been instrumental in the employment of the Pundits. All that he had to do with the system was this. When Captain Montgomerie first commenced sending natives into the interior, he (Sir R. Montgomerie) procured for him a man in 1863, who went up to Yarkand and made observations. He believed he was the first native who accomplished such a journey. Subsequently, Captain Montgomerie adopted the plan of employing Pundits, and he had no doubt that, hereafter, we should receive very important information from these men.

Sir ANDREW WAUGH said that he had the honour of having trained Captain Montgomerie originally as an Indian surveyor, and he was naturally proud of his present achievements. He must accord to him the entire credit of having originated this system of employing native agents. Captain Montgomerie was one of his favourite officers, and belonged to his staff, and he had proved himself so worthy that the Society had awarded him their gold medal. He might remark that surveys of routes in these stupendous mountain regions were exceedingly difficult, requiring great skill, caution, and scrupulous care to prevent the intrusion of large errors. For the Pundits to close their survey with an ascertained error of only two miles and a half in so long a mountainous circuit, showed not only that dependance was to be placed in their accuracy, but also that they had been trained on right principles. He was sure Captain Montgomerie would carry this enterprise still further, and that we should yet receive even more interesting accounts of still more *terra reclusa*.

The PRESIDENT believed that the award of a gold watch to the first Pundit, in 1868, had been productive of much advantage. He hoped, before another year was over, the Council would have to vote an additional honorary distinction.

2. On the Transit of Tea from North-West India to Eastern Turkistan.

By T. DOUGLAS FORSYTH, Esq., F.R.S.

THIS communication consisted of a letter addressed to the President of the Society by Mr. Forsyth, with an enclosure from Mr. Shaw, who is now engaged in a commercial undertaking to the capital of Eastern Turkistan:—

"MY DEAR SIR,

"Jullandar, 26th February, 1869.

"As you will be anxious to hear of the progress of Lieutenant Hayward, whom you have sent out on an expedition to Yarkand, I send herewith the copy of a letter just received from Mr. R. Shaw

to his sister, who has placed it at my disposal. Mr. Shaw is the first Englishman who has ever sent a letter from that country to us, and, with the exception of Mr. Johnson, the first Englishman who has ever been in Eastern Turkestan, and lived to let us know about the land. I trust his life may be spared, and then I have no doubt that we shall soon see trade communication freely established between the two countries.

"The path for Mr. Shaw's entry was carefully prepared. When I was at Leh last September, I sent a horse-load of tea with a letter to the Kooshbegi, telling him that this was only a sample of what could be supplied in larger quantities from the Indian tea-plantations. At the same time the Kooshbegi was asked to receive favourably a caravan of traders, who went with the Vakeel who had my letter. In this caravan was one of Mr. Shaw's servants, who took presents from his master to the Kooshbegi. Mr. Shaw himself followed about three weeks afterwards, and waited at the confines of Turkestan for news from his servant. He received encouragement to proceed, and his letter tells the rest. Further information, as soon as it is received by me, shall be sent to you.

"Mr. Hayward's approach, it appears, was not made smooth beforehand, and, as the people of that country are naturally suspicious, they have hindered his advance. No personal injury, however, will, I trust and believe, be done to him, for the Kooshbegi is evidently desirous of entering into friendly relations with us.

"I have to thank you exceedingly for the very kind letter you have sent me, and for the flattering notice which you are good enough to bestow on my humble efforts to open out trade with Turkestan. I can truly say that, in setting this task before me, I have been actuated by no idea of Russophobia, and, in justice to myself, I hope you will allow me to explain that recent allusions by us to possible complications with Russia have been greatly misunderstood by the English press.

"I will not enlarge on this subject, which is foreign to the commercial and scientific question with which alone the Royal Geographical Society concerns itself, but I owe it to you, as our distinguished President, no less than to myself, to say that, because the impression had got firmly fixed in people's minds that my efforts to open out this trade were utterly futile on account of the impassable character of the Himalayas, I ventured to show how very easy the passage by the Changchenmo route really is. You, doubtless, know that the province of Ladak has been invaded ere now by a Kalmyk army passing over this route.

"Having but one object in view—the furtherance of trade and

the advance of science—I desire to pursue the subject with single earnestness of purpose; and it is, indeed, a high honour and reward to receive words of encouragement from the President of our Society.

“The great interest which Lord Mayo takes in the subject is a guarantee that this interesting country will not much longer remain a sealed book to us.

“I may add, that Mr. Shaw is one of our most enterprising settlers in the Kangra Valley. After receiving an University education, he came out to India to set up as a tea-planter. From the time when we commenced to make efforts for taking advantage of the expulsion of the Chinese to open communications with Yarkand, Mr. Shaw has evinced the utmost practical interest in the subject, and I am personally indebted to him for valuable information and important help. This year, when he announced to Dr. Cayley and me his determination to visit Yarkand, I honestly confess that I did my utmost to dissuade him from running what was considered by so many a fearful risk. To him, therefore, rather than to any one else, will be due all the credit of success, should we hereafter find our mercantile relations with Yarkand established on a sound basis.

“Even if Mr. Hayward should fail to penetrate into these regions, I feel sure that your Society will, ere long, receive most valuable and reliable information regarding them from one whom I am glad to be able to call my friend.

“I am, my dear Sir,

“Yours, very faithfully,

“T. DOUGLAS FORSYTH.

“Sir R. Murchison, Bart., &c., &c.”

Copy of Letter from Mr. R. Shaw to his Sister at Lahore.

“Camp near Sanju, Turkestan, Nov. 25th, 1868.

“I AM within a few days of Yarkand, having crossed the last pass on my road yesterday (the 11th since leaving Dhurmala). I am being received in the most handsome manner. A well Moghul came as far as Shahdulla Khoja (beyond the pass) to meet me. I was detained there eighteen days for orders from the King. The delay was chiefly caused by the arrival (most inopportunately) of a second Englishman. However, on the 20th, we left Shahdulla, and to-day have been met by the Governor of Yarkand's brother, who has been sent to meet me as Mihmandar, with a large camp. Guns

were fired, and I was escorted in state to a Kirghiz tent (see Atkinson's 'Siberia' for description). I was ushered in, made to sit alone in the place of honour, on the carpet at the far end, while my Mihmandar sat on a side carpet. He gave me the most complimentary welcome from his King, saying that he was sent simply in order to facilitate my journey and consult my wishes. I paid him a return visit at his tent, and in departing was clothed with a silk robe. I must tell you that I now dress entirely as a Turkee, turban, robe, and everything. He excused himself for the want of proper presents out in the jungle, saying otherwise I should have received a horse, &c.

"None of my servants are allowed to go on foot; even the Tibetan coolies are mounted on yaks. I have picked up some knowledge of Turkee, and hope to improve in it during the winter.

"In fine, you may consider that I am about as well off as I could be, were my utmost wishes realised in the present matter. All my goods, too, have been taken over by the King's people, who are to give the price. The tea will fetch about 8 rupees per pound, as far as I can make out. It is much liked. Unfortunately, half my caravan, which was following me, has either wandered off towards China or gone to Khoten by mistake.*

"The apples and pears are delicious here, after a long desert journey. A lot of fruit and a sheep are given me every day, and I have now a large flock, though all my servants are sated with meat. They, too, are gorgeously clothed. This letter will go inside a bag of flour with the return Tibetan yak-drivers; for my hosts, although most polite, are very suspicious of letters in unknown tongues. I am afraid the other Englishman, Hayward, who is sent by the Royal Geographical Society, but has not prepared his way as I have, will not be allowed to come on. He is kept under guard at Shahdulla, and we were not allowed to communicate."

The PRESIDENT, in calling for observations on the adventurous and successful undertaking of Mr. Shaw, said he would take this opportunity of correcting a misapprehension into which many persons had been led respecting some prior observations on this route by Sir Henry Rawlinson. All that Sir Henry meant was, that there was a road across the Himalaya and Kuen-lun available for camels and yaks, without very great difficulty; and this had been taken as an admission that this route was practicable for an army.

Sir HENRY RAWLINSON said he had the honour on a previous occasion to notice the opening out of this particular road, which was now generally

* The man in charge lost his way and returned to Ladak. He has since written to tell me of his making a fresh start to join his master.—T. D. F.

known as the Changehenmo route, and to be the most direct and easiest route between Ladak and Turkestan. Judging from the information then available, he certainly said the physical difficulties of the route were very much less than those of any other, and that it promised to be a valuable line for commerce. At the same time he said he considered such a route was impracticable to an army. To move a caravan consisting of a few mules and camels was a very different thing from moving an army with a commissariat. He had been met on that point by the statement that in former times armies had marched without great difficulty from Kashgar to Cashmere, in fact that one of the kings of Kashgar had died at Cashmere. He must reply to that by saying that the passage of the flying hordes which, in former days, swept over Asia, led by Mogul emperors, had no analogy to the movements of armies in the present day. Those flying hordes never carried a commissariat, and never required one. There was one point in Mr. Shaw's journey which he wished to refer to, and this was that a portion of the route he travelled over was absolutely new to us. When on the former occasion he described Mr. Forsyth's route, he was not aware that Dr. Cayley had himself travelled over the whole distance from Leh to the Karakash River. But he was now in possession of Dr. Cayley's Report, with an excellent map of his journey; and had received from him, since he had returned to England, a description of his journey in detail. Dr. Cayley, who was our agent at Ladak, in September last year, travelled along this route by the Changehenmo route to the Karakash. Here began the difficulties. When Mr. Johnson went to Hiti he crossed the great range by two very difficult passes; but he heard that there was a route down the banks of the river. Dr. Cayley travelled to the same point, but was unable to go down the river. Mr. Shaw had now accomplished this. He travelled by the Changehenmo route as far as the upper waters of the Karakash, and then he followed the banks of the river to Shadula. He found this road an easy one. Hitherto, he believed, no one had followed the Karakash River down into the plain of Tartary. Dr. Cayley had informed him that where the route left the river it was quite impossible for any traveller to keep to the bed of the stream. The only means of entering the plain was by crossing a saddle on the west of the Karakash River, called the Sanju Pass. With respect to Mr. Hayward, he still hoped that that gentleman might succeed in getting forward, and that he would send us some very valuable information. Regarding trade, it was interesting to hear that Mr. Shaw sold his tea at 16s. per lb. Considering that the same tea could be purchased in England at 2s. 6d. per lb., 16s. per lb. was a tempting bait to traders. Unfortunately, as we learned from the Pandit's paper, the Tibetans did not like Himalayan tea, they preferred China tea. It should also be borne in mind that our merchants in taking tea to Yarkand would meet with very great competition on the part of Russia, who was doing all she could to extend her trade. He thought it was all the better for our merchants that they should have to meet competition rather than that they should go into a market with unlimited control.

Captain SAMUEL OSBORN congratulated the Society upon the steady way in which, by pandits, travellers, or by tea-merchants, we were getting rid of another of those hughwars, the so-called impenetrable geographical barriers of the world—the Himalayas. Some years ago a Russian officer asked him if the English had not put a good many thousand feet on to the Himalayas, and created a good many difficulties there, for political purposes. He began to think that there was some grounds for the question, and that we should find, as we went on exploring, that where there were routes available for yaks, ponies, and horses, there would soon be found others fit for all commercial purposes. It struck him that the line of the Russian territory, which he held was the line of civilisation, would come down southward and obliterate that

Mahomedan barbarism which had been the real impenetrable barrier in Central Asia. The Russians would come down as a natural law, and the sooner we recognised that fact, and the sooner we got rid of all our fears respecting the extension of Russia, the better for the world and for us.

Eleventh Meeting, April 26th, 1869.

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT,
in the Chair.

PRESENTATION.—*Frederick H. Leaf, Esq.*

ELECTIONS.—*E. C. Bowra, Esq.; Frederick T. Galunthy, Esq.; C. T. Gardner, Esq.; Edward J. Leveson, Esq.*

ACCESSIONS TO THE LIBRARY FROM APRIL 12TH TO 26TH, 1869.
By Purchase.—Chardin, 'Voyage en Perse.' 10 vols. Paris, 1811. Cordiner's 'Ceylon.' 2 vols. 1807. Cunningham's 'Cosmographical Glass,' 1859. D'Anville, 'Carte de l'Inde,' 1753. D'Anville, 'États en Europe.' 1771. Davison's 'Africa.' 1839. 60 Tracts relating to Dutch Possessions in the Indian Archipelago. 1799 to 1847. Engelmann's 'Bibliotheca Geographica.' Hoffmeister's 'Ceylon, 1848.' 'Missioni alla Cocincina.' Roma, 1631. 'La Bissachere Tunkin.' 2 vols. 1812. Mann's 'Mer Noir,' &c. 1778-79. Marryat's 'Borneo, 1848.' Osbeck's 'China, 1771.' Prevost's 'Collection des Voyages.' 19 vols. 1746-70. Seemann's 'Viti, 1862.' Shelvocke, 'Voyage Round the World, 1726.' Temminck, 'L'Inde Archipel.' 3 vols. 1846-49. 'Viaggi di tre Francesi,' 1669. Pertusier, 'La Bosnie.' 1822. Fortis' 'Dalmatia, 1778.' Gamba's 'La Russie, 1826.' 'Histoire de la Moldavie.' 1781. Ardenin's 'Haiti.' 2 vols. 1853. J. E. Tennent's 'Natural History of Ceylon.' 1861. Von der Decken's 'Reisen in Ost-Afrika.' 1869.

By Donation.—Carl Zimmermann's 'Chiwa.' Berlin, 1840. By W. Spottiswoode, Esq. 'Duala Language of the Cameroons River.' The same.

ACCESSIONS TO MAP-ROOM SINCE THE LAST MEETING OF APRIL 12TH.
—Carte lithologique des Mers de France, &c. Par M. Delesse, Professeur à l'École des Mines. Presented by Sir R. I. Murchison, Bart., President. Map of the Eastern Part of Abyssinia, showing the Route of the British Army in 1867-8 from Annesley Bay to Magdala. By Dr. A. Petermann. Presented by the author. A large Map of China in 32 Sections (in Chinese characters). Presented by J. S. Coysh, Esq., F.R.G.S. Two Diagrams, showing the Surface

Temperature, &c., of the North Atlantic Ocean, for the month of January, during the years 1849-52. By N. Whitley, Esq.

The following Papers were read:—

1. *Recent Explorations in the Peninsula of Sinai.*

By the Rev. F. W. HOLLAND.

THE project of a systematic survey of the Peninsula of Sinai owes its origin to the Rev. Mr. Pierce Butler, late Rector of Ulcombe, Kent; and although he himself was not spared to aid in carrying out that project, to which he had devoted so much energy and thought, to him we are mainly indebted that a well organised expedition, under the superintendence of the Director-General of the Ordnance Survey, is now engaged in making explorations in that most interesting country.

I much regret that the present session of the Royal Geographical Society will have come nearly to an end before the return of the officers in command of that expedition, and that they themselves will therefore not have an opportunity of laying before you the result of their work.

But such being the case, having had the advantage of working with them during the first three months that they spent in the Peninsula, and having had access to their reports and letters home since that time, I have ventured to record in the following Paper the progress that has been made.

There are many people, I believe, who have concluded that the Peninsula of Sinai must *already* have been a well explored country, since so many travellers have visited it, and so many books have been written about it: but, owing to various local causes, there is probably no other country in which travellers have been led to carry out more fully their ovine propensity to follow exactly in each other's steps; and, consequently, it is only the *main wadys*, or valleys, which form the high-roads, and one or two of the principal mountains, that have been explored, and even those very hastily and incompletely. There can be no doubt, too, that the religious enthusiasm which has led many travellers to the country, however much it may claim our sympathy, has nevertheless tended in a very great degree to lower the value of the information obtained. A man who goes out with foregone conclusions as to what the country *ought* to be, and where the Children of Israel *ought* to have marched, is almost sure to favour his own prejudices to the exclusion of truth.

Thus it happens that although the *coast line* of the Peninsula of

Sinai has for many years been well laid down by a nautical survey, the *interior* has remained, with the exception of a few parts, but little known to us; and we have had as yet no sufficiently accurate data for instituting a just comparison between its *present* and its *past* condition, or asserting how far it illustrates the truth of that history, which alone renders it a land of such intense interest to us. Hence the importance of a *careful* and *systematic* survey of the country, conducted by professional men, free from all bias, and of whose accuracy there cannot be any suspicion.

The organisation of the expedition is all that could be wished. It is under the command of Captains Wilson and Palmer, of the Royal Engineers, the former of whom is well known for his admirable survey of Jerusalem. The other members of the expedition are Mr. Palmer, Fellow of St. John's College, Cambridge, a very able Oriental scholar, and quite worthy of the name of "Pundit," which he soon received to distinguish him from Captain Palmer; Mr. Wyatt, who volunteered to go out entirely at his own expense, to study the natural history of the country and collect specimens; Sergeant MacDonald, who is an experienced photographer, and three other non-commissioned officers of the Royal Engineers, all of whom have been specially selected for the work from the staff of the Ordnance Survey.

My own previous knowledge of the country and Arabs, gained chiefly during four months' solitary wandering amongst them in the preceding year, led to my being requested to accompany the expedition in the capacity of guide, a request to which I readily acceded, and I remained with them up to the beginning of February (when I was obliged to return home), rendering such assistance as I could.

We sailed from Southampton on the 24th of October last, and landed at Alexandria on the 7th of November. The Viceroy, at the request of Colonel Stanton, had given orders that our baggage should be passed through the custom-house unopened, and that every assistance should be given us by the officials; and thus we were enabled to proceed that same evening to Suez, where we arrived early on the following morning.

I had sent a message several weeks before to some of the Arab sheikhs of Sinai to tell them that we were coming out; and on alighting from the train I was welcomed by several of my old acquaintances, who for many days had haunted the platform in expectation of our arrival.

The Peninsular and Oriental Company kindly gave us permission to draw provisions from their stores; and three days were busily

spent at Suez in selecting and packing the things we required, buying water-skins, barrels, and the numerous requisites for a desert life, and drawing up a contract with the Arab sheikhs for camels, which is always a somewhat lengthy process.

Mr. Palmer, who had arrived in Egypt a few weeks before us, now joined us. He had meanwhile been profitably engaged in Cairo, in examining the colleges and libraries attached to some of the principal mosques.

On Wednesday, November 11th, we sent on our camels round the head of the Gulf of Suez, to await our arrival on the opposite shore, and in the afternoon conveyed our baggage across by boat, and pitched our tents for the first night in the desert. Our caravan consisted of 32 camels laden with our baggage and stores, and 12 dromedaries for riding, including those of our two sheikhs.

The Arabs in the southern portion of the Peninsula of Sinai are so poor, that no single sheikh was able to provide so large a number of camels as we required, and we therefore found ourselves compelled to engage two sheikhs, an arrangement which was a continual source of contention as long as they were with us, since there was a daily fight for the lightest loads, and much jealousy between the two parties, neither of whom paid very much deference to their respective sheikhs. The management of the Arabs, therefore, and superintendence of the daily loading of the camels, which fell to my charge, was at this time no sinecure.

Three days' journey brought us to Wady Ghurundel, where we halted for Sunday. We took the upper road after passing "the wells of Moses," and the barren plain along which our course lay offered few points of interest. Mr. Palmer found, however, that several of the names which have been given to different wadys in this portion of the desert are wrong, and none of them appeared to have any reference to the passage of the Israelites, as some authors have supposed. We saw abundant evidences, as we proceeded, of different sea-levels of former times, and many of the stones are curiously furrowed and wrinkled by the action of the drifting sand. I remarked that some of these stones presented the exact appearance of miniature sand-drifts.

We stopped on our way to examine the spring of "Ain Howara," which many have sought to identify with *Marah*, on account of the bitterness of its water. The water was slightly brackish and dirty, but it was cool and drinkable, and better, I thought, than the water that we had with us. I cannot satisfactorily explain the extreme bitterness of this water at one time and its comparative sweetness at another. A few miles south of this point a natural basin is found,

into which the water drains from the surrounding desert, and its fertility proves how productive the desert is wherever water can be obtained.

While encamped in Wady Ghurundel we enjoyed the luxury of a bathe in the clear running stream, which bursts forth a few miles from its mouth but again disappears in the sand before it reaches the sea; not, however, before it has given birth to a considerable amount of vegetation, and formed extensive marshes, which are the favourite resort of wild ducks and other birds.

We also examined the country between Ain Howara and the sea, near the mouth of Wady Ghurundel, and found it to consist of broken ground with deep intersecting wadys and ridges, which must always have rendered it utterly unsuitable for a camping-ground.

From Wady Ghurundel we made our way across the plain, at the heads of Wadys Useit and Eth Thal, and up Wady Humr, to Jebel Sarbût el Gemal. Shortly after leaving Wady Ghurundel we passed the well-known heap of stones called Abu Zenneh. The Arabs, in passing, always curse the spot, shoot off their guns at it, and throw stones upon the heap, saying, "Eat, eat, horse of Abu Zenneh." The reason of their doing so has never yet been explained, but Mr. Palmer obtained from our Arabs the following interesting legend concerning it:—"An Arab named Zenneh, who possessed a beautiful mare, as he rode by this spot one day, touched it with his spur, and it took an enormous leap, the length of which so astonished him that he marked it with two stones, and pointed it out to his friends, who never afterwards passed this spot without celebrating the praises of the mare. After a time the Arabs began to worship her, and brought offerings of corn, which they threw down, saying, 'Eat, eat, horse of Abu Zenneh.' But at length a prophet came who taught them to worship the true God, and to give up the worship of all other things; and that which they had before worshipped now became an abomination to them; so that they no longer brought offerings of corn, but threw dust and stones upon the heap, saying, 'Eat this, horse of Abu Zenneh.'"

This legend seems to bear some marks of truth, and I would remark, in passing, that the mention of a horse is interesting, as a slight additional evidence of a change having taken place in the country, since horses are now unknown there, and could not exist in so barren a desert as it is at the present time.

In Wady Humr we saw the first Sinaitic inscriptions. From this point they occur frequently along the different wadys which form the roads to Jebel Serbal, Jebel Mûsa, and the south.

From Jebel Sarbût el Gemal we struck southwards, across the

sandy slopes of Debbet-en-Nusb, to Wady Nusb, well known for its excellent wells of water, which caused it to be formerly the centre of the mining operations in that district, as is shown by the large heaps of slag which are found at the mouth of the valley, and more especially in the immediate neighbourhood of the wells. We did not, however, then stop to examine the mines, but pushed on as quickly as possible towards Jebel Mûsa. We paid a hasty visit to the ruins of Serâbit-el-Khadim in passing, and I was able to point out to Captain Wilson the position of the turquoise mines, Egyptian tablets, and other ruins, which have since been revisited and more fully explored.

We followed the northern route to Jebel Mûsa by Wadys Kamyle, Burku, and Berâh, because it afforded the shortest road, and the most favourable, for a line of observations between Suez and Jebel Mûsa. Materials for a route-sketch of our journey were collected as we proceeded, observations for latitude were taken at every camp, and aneroids read at all watersheds and watercourses.

At the head of Wady Berâh we ascended a remarkable conical hill, called Zibb-el-Bahayr, from which a magnificent view is obtained of the whole surrounding country. The uniform height of many of the granitic mountains is a striking feature, and suggests the idea of there having originally been a vast plateau of granite, on which the sandstone was deposited; the wadys, which now intersect it in every direction, having been subsequently formed by the action of water. Lower down, in Wady Berâh, we passed a large detached rock, covered with Sinaitic inscriptions, which was said by the Arabs to have been cleft by Moses with his sword, to enable the Israelites to pass it. At the foot, at that wady, we crossed over by Wady el Akhdar (the Green Valley) and Wady el Ush (the Valley of the Nest) to Wady es Sheikh, which we followed up till it brought us, on Nov. 21st (just ten days from the time of our leaving Suez), to Jebel Mûsa. Wady el Akhdar is the name of the wady to which in my former paper I gave the name of Wady el Huther. I was wrong, therefore, in supposing that I might have found here traces of the name Hazeroth.

After selecting a spot for our camp at the foot of the so-called Aaron's Hill, near the mouth of Wady ed Deir, we paid a visit to the convent, where we were most hospitably received by the monks, and they very kindly placed a room at our disposal as a store-room. They pressed us to take up our quarters in the convent, but we preferred the independence of a tent life.

Having dismissed all our Arabs, and unpacked our stores, we set to work at once upon the special survey of Jebel Mûsa, which was

to be made on the scale of six inches to a mile. A base was selected on the plain of er Rahah, and the limits of the survey having been settled, viz., the watershed of the plain of er Rahah on the north, Jebel Abu Aldi on the south, Wady Sebaiyeh on the east, and Wady Leja on the west, we all set to work to get the poling done, while the men were engaged in measuring the base and lower ground. The base was 69 chains 34 links in length, and the dimensions of the survey 4 miles by $4\frac{1}{2}$. The poling was a work of great labour. The monks supplied us with some good poles for the ends of the base, but at all other stations we had to build cairns of stone, and whitewash them.

There were twenty-nine stations, and, with the exception of four, their heights above our camp ranged from 800 feet, the lowest, to 2500 feet, the highest. But the height in feet does not give any idea of the difficulty of the climbing which had to be done. The necessity of carrying a pot of whitewash in one's hand, the upsetting of which would often have lost one a whole day's work, added much to the difficulty; and it had sometimes to be carried in the mouth as we crawled along narrow ledges overhanging precipices many hundred feet in height, or used each other by turns as ladders. Once Captain Palmer and I found ourselves on a ledge of rock on Jebel Mûsa from which it was impossible to proceed either up or down, but fortunately I had taken the precaution that day of taking with me a rope, and with it I lowered down Captain Palmer, and then, lying on my back, slid down as gently as I could, and he succeeded in breaking my fall at the bottom.

When the poling was completed we had again to visit most of the stations to take observations from them—a work which we could hardly have accomplished without the aid of some Arab ibex-hunters, whose bare feet, and experience in mountain work, enabled them to carry up the instruments without injury—and the calculation of the observations gave most satisfactory results. In the lower ground there were $31\frac{1}{2}$ miles of traverse, not including offsets. The leveling, which amounted to $19\frac{1}{2}$ miles, was also a work of great difficulty, on account of the roughness of the watercourses and the great rises and falls crossing the watersheds.

I regret that I am unable to give accurate measurements with regard to the details of this survey, but a brief account of its main features may prove of interest. The peaks of Ras Sefsafeh, which form the northern portion of Jebel Mûsa, mark pretty nearly its central point. These rise up precipitously (about 2000 feet high) from the base of the plain of er Rahah, which is about two miles long and half a mile broad.

The plain of er Rahah is bounded on the west by a low ridge of mountains, which separates it from Wady Ilah and Jebel Tinia, and on the east by the block of mountains generally known as Jebel Fureya, but that name is properly applied only to the fertile basin which occupies the northern portion of the summit of that block. There appears to be no single name for the whole block, but the peaks which enclose it all have their individual names, such as Ajeramea, Allojah, Soná, &c.

The southern peak of Jebel Mûsa is its highest point, and to this the name of Jebel Mûsa is especially applied. A central elevated basin, encircled by a ring of higher peaks, is a common feature in the mountains throughout the granitic district, and such is the character of the block of Jebel Mûsa, which is about 2 miles long and 1 mile broad. On the east of it runs Wady Ed Deir, so called from the convent which is situated here, and west of it runs Wady Shuraich, which again is separated from Wady Leja (a valley lying farther westwards) by the narrow ridge of Jebel Fara. Thus on the north, east, and west, Jebel Mûsa is separated from the surrounding mountains; on the south two wadys—one flowing eastwards into Wady Sebaiyeh, and the other westwards into Wady Leja—separate it from Jebel Abu Aldi, and the high range of mountains which bounds Wady Sebaiyeh on the west.

At the head of the convent valley stands a low rounded mountain, called Jebel Munedjah, and on the east of it the fine block of Jebel Ed Deir, which is divided by two ravines running north and south into three parts, the central and highest one of which is called Jebel Oribeh. An extensive recess, about $1\frac{1}{2}$ mile long by $\frac{1}{4}$ broad, near the mouth of Wady Leja, adds largely to the available camping-ground before the Ras Sufsafeh, which is generally supposed to have been the point from which the Law was given. There are five paths to the top of Jebel Mûsa.

(1.) A carriage-road made by Abbas Pasha from the head of the convent valley.

(2.) The well-known path leading up from the convent.

(3.) Another path up a ravine at the north-east corner of the mountain, by which we generally ascended it from our camp.

(4.) A fourth, leading up from the head of Wady Shuraich.

(5.) And the fifth from the ruined monastery of "El Erbain," at the head of Wady Leja.

The four last all appear to show traces of rude steps, which probably date from the earlier monastic times. The number of ruins of hermits' cells, which are found scattered over the surrounding mountains, is perfectly extraordinary; and the frequent occurrence

of walls, reservoirs, and traces of terraces for gardens, proves that almost every available spot was at one time under cultivation. There is no doubt that corn was grown in many spots; and when all the valleys and mountain-basins around Jebel Mûsa were more or less a succession of gardens, containing vines, palm, apricot, apple, pear, orange, pomegranate, walnut, mulberry, and carrib trees,—when the supply of water from every spring was carefully husbanded in reservoirs, and skilfully conveyed from garden to garden,—it must have presented to the eye a perfect paradise.

While encamped at Jebel Mûsa we made an excursion to Jebel Ahn Mas'ûd, in order to take bearings from the summit of that mountain, which was to form the south-east limit of the reconnoissance survey, and also to examine a remarkable group of ruins called by the Arabs "*namâs*," or in the plural "*nuâmîs*," mosquitos, which I described in a former paper.

"These buildings," writes Captain Wilson, "are almost circular, with a domed roof rising immediately from the lintel of a door about 21 inches high; the dome is formed by stones overhanging each other, the top being closed by a large slab of stone, and the haunches weighted to prevent their springing out. I cannot describe them better than by saying that they are identical in construction with the chambers in the large cairns at Clava, near Inverness, one of the oldest known forms of habitation. Several of the '*nuâmîs*' have been used as burial-places by a people probably of a later date than the builders of the houses, but still at a very remote period. Three of these were opened, but no opinion could be formed on the mode of burial. The bones were found mixed with earth and a little charcoal, but crumbled to pieces directly they were touched: a shell bracelet, broken and mended again, and a shell bead, were the only articles found. On our return to Jebel Mûsa we found a group of five stone circles, with small cairns in the centre exactly similar to what are called Druids' circles in Scotland, the stones being set on end and touching each other."

I may add that the "*nuâmîs*" and stone circles are found in great numbers throughout the whole of the south of the Peninsula; the largest groups that I have found being situated in a small wady between the head of Wady Hibran and Wady Solaf, in the neighbourhood of Dahab, and on the plateau of Zeranik.

Towards the end of December it grew so cold that hill-sketching was impossible on the higher mountains, and occasional snow-storms interfered much with the progress of the survey. Most of the highest peaks in the neighbourhood of Jebel Mûsa were, however, ascended, and true bearings were taken from Jebels Katharine, Ed Deir, Tiûia

(on the summit of which stands Abbas Pasha's half-built palace), and several other well-known mountains; and thus the position of most of the prominent peaks in this part of the Peninsula was fixed, and their altitudes determined by angles of elevation and depression. The altitudes of all peaks ascended were also determined by boiling-point thermometers and aneroid barometers; but the latter we found could not be depended upon to 300 or 400 feet, at so great an altitude above the sea (5000 feet).

I should mention that the latitude of our camp was obtained by the mean of twenty-two observations, and from this the latitudes of Jebels Mûsa and Katharine were computed. Observations for longitude and variation were also taken.

On the 1st of January we started for Jebel Serbal, connecting it on our way with Jebel Mûsa by a traverse survey, which was carried "through the pass" of Nukh Hawa, at the head of the plain of er Rahah, and down Wady Solaf and Feiran.

The special survey of Jebel Serbal (also on the scale of 6 inches to the mile) presented difficulties almost as great as that of Jebel Mûsa.

A base was selected in Wady Feiran, between el Hassue and Wady Ajelah. The same process of cairning had to be gone through, and each morning, for upwards of a week, we started off, with our pots of whitewash in our hands, to climb peaks, the ascent of two or three of which, notwithstanding their close proximity, often proved a hard day's work, so deeply were they cut by intersecting ravines.

Our camp was pleasantly situated at the junction of Wady Aleyat and Feiran, close to the oasis of Feiran, which terminates just at this point.

The following description of the mountain is taken from a letter written by Captain Palmer, after nearly a month's stay there:—

"Jebel Serbal is about 4 miles from the camp. In massive ruggedness, and in boldness of feature and outline, this mountain unquestionably presents an aspect unequalled by any other in the Peninsula, and, though not absolutely the highest, it has a greater command over the surrounding country than any we have yet seen. Unfortunately there is not a single point in the valleys near its base, which affords a comprehensive view of the mountain. It is only by ascending some of the neighbouring hills that the whole range of its magnificent peaks can be seen at once, and there is no plain anywhere in the vicinity suitable to the assembling of a large concourse of people in the sight of any one portion. Two valleys, Wady Aleyat and Ajelah, each from 3 to 4 miles in length, rise from Wady Feiran to the actual base of Serbal, and furnish the

roughest examples we have yet experienced of the very rough walking in the Peninsula.

"Each (and especially Wady Ajelah, the western and narrower valley) is a wilderness of boulders, and torrent beds, and high banks of alluvial deposit, bearing the marks of many a flood. From points in these two valleys, and from a few spots also in Wady Feiran, imperfect views of Serbal are to be had; but from Wady Ajelah the highest peak is never seen. The space between the two, which, I think, has been described as a *plain*, is a chaos of rugged mountains, rising to as many as 2500 feet above Feiran, and concerning which our boots and knees could tell a very different tale."

The special survey comprised these two valleys and a portion of Wady Feiran, rather more than 2 miles in length.

While encamped in Wady Feiran we made many excursions to the surrounding mountains, and, amongst others, made the ascent of Jebel Benât, which, I believe, had never before been attempted.

During our whole stay in the Peninsula, Mr. Palmer and I had been constantly employed in examining and copying the Sinaitic inscriptions; and we had already collected upwards of 1800 from the granitic districts, when, on the 26th of January, we left the rest of our party for Wady Mokatteb, to work at the inscriptions there in their head-quarters.

We first copied every legible inscription in Wady Mokatteb and Sidri, and then took impressions in paper and photographs of some of the most important ones.

We discovered altogether no less than twelve inscriptions in which the Greek and Sinaitic occur together, undoubtedly by the same hand, and by their means Mr. Palmer has been enabled to demonstrate the value of every letter of the Sinaitic alphabet.

Mr. Palmer has very rightly determined not to publish the full results of his study of the inscriptions until he shall have been able to consult the works that have already been written on the subject, and to devote more time and care to the examination of the copies which we have obtained than he is able to do in the intervals of his present work. But a letter from him, which was published in the 'Athenæum' of the 10th of April, states some of the conclusions at which he has arrived. He describes the inscriptions as consisting of detached sentences, for the most part proper names, with such introductory formulæ as Oriental peoples have been from time immemorial accustomed to prefix to their compositions (e.g. "Peace be to him," or "May he be remembered").

He speaks of the alphabet as agreeing in part with that constructed by the late Professor Beer, which is only partially correct,

since the copies of inscriptions with which he was furnished were not accurately made. With regard to the authorship, there can be no doubt that they are the work, not of pilgrims, but of a commercial community who inhabited, or at least colonised, the Peninsula for the first few centuries of the Christian era. That many of the writers were Christians is proved by the numerous Christian signs they used; but it is equally clear from internal evidence that a large portion of them were Pagans.

The numbers of the inscriptions have been much exaggerated. They were executed, no doubt, almost entirely with pointed stones, and the presence of water seems to have acted more than anything else in determining their position. It is not true that they occur at extraordinary heights from the ground, nor that they were confined to the road or roads to Serbal. I discovered them last year in wadys both east and south of Jebel Mîssa; and I believe that Captain Palmer has now also found them as far west as Jebel Taset-el-Sadur. They are by no means confined to the main roads, or valleys, but are to be found in all sorts of out-of-the-way places, along mountain footpaths, and on the tops of prominent peaks. They do not appear to be connected with mines, and there is evidently no connection between the Sinaitic and two hieroglyphic inscriptions at Wady Mughârah, the close proximity of which has led them to be described as a triple inscription. Lastly, they do undoubtedly occur *painted in whitewash* under an overhanging rock at the summit of Jebel Serbal; and the ruins of a building close by, in which similar whitewash occurs, seems to point to the fact that the inscriptions and the building were made by the same hands. Mr. Palmer speaks with confidence of his being able to bring as great a weight of testimony to bear on the authorship of the inscriptions as he has already collected in support of their interpretation. Few men are so well read in Arab literature, and I sincerely hope that his confidence will not prove to be misplaced.

It was with great regret that I turned my steps homewards from Wady Mokatteb just at the time when the special survey of Serbal had been so far completed as to set Captains Wilson and Palmer free to commence the general survey of the country. The limits of this general survey, on the scale of 2 inches to the mile, were to comprise the country between Suez, the ranges of Jebels er Rahar and Tih, the plain of Saïmed, Jebel Abu Mas'ûd, Jebel Umm Shauner, Tur, and the Red Sea, *i.e.* the district through which the children of Israel must have marched, if either Jebels Serbal, or Mîssa, or any mountain south of the Tih range, be the real Mount Sinai. The special surveys have taken up so much time, that it has been found

impossible to survey the whole of this district, but all the principal valleys which alone could form the roads have been traversed. On leaving Serhal, Captains Wilson and Palmer followed down Wady Feiran, and joined "the Pundit" at W. Mokatteb. A few days were spent here in examining the mines, and then they continued their course down Wady Sidri, which has never before been traced, to the mouth of Wady Feiran, and so on to the plain of El Kaa, and to Wadys Thugadeh and Sigillyeh, at the western base of Jebel Serhal.

In Wady Thugadeh they found a small stream and a good-sized palm-grove, but nothing more of interest. A day was devoted to the ascent of Wady Sigillyeh. At its mouth giant cliffs frown down upon a narrow chasm, in many places scarcely 20 feet in width, through which the drainage of nearly the whole southern slope of Jebels Serhal and Sigillyeh breaks by a succession of leaps into the plain below. Higher up, the valley expands into a wild and romantic mountain glen, through which flows a perennial stream. At the head of the valley stand the ruins of two monasteries, which were afterwards visited from the other side of Serhal.

From Wady Sigillyeh, a dreary walk of 20 miles over the burning waste of El Kaa brought them to a spot called Abu Suweirah, on the shore of the Red Sea, not far from the celebrated Bell Mountain, Jebel Nakaa. I have myself twice visited this mountain, but I prefer to describe it in Captain Palmer's own words:—"At a point about three-quarters of a mile, in a direct line from the sea, a slope of drift-sand 400 feet in height, and facing about w.s.w., fills a wide gully in the range of sandstone hills which flanks the mouth of Wady Arabeh on its southern side. This sand is so extremely fine and dry, and lies at so high an angle (about 30°) to the horizon as to be easily set in motion from any point in the slope, or even by scraping away a portion of the sand at its base. When any considerable quantity is thus set in movement, rolling gradually down the slope like some viscous fluid, then the sound begins—at first a deep, swelling, vibratory moan, gradually rising to a dull roar, loud enough at its height to be almost startling, and then gradually dying away till the sand ceases to roll. It is difficult to describe the sound. Perhaps the very hoarsest note of an Æolian harp is the best comparison I can draw, or even the sound produced by drawing the finger round the wet rim of a deep-toned finger-glass, save that there is far less music in the note produced by this rolling sand. Hot surface sand always appears to be more sonorous than the cooler layers underneath. The loudest result was obtained in the full heat of the afternoon sun, when the surface sand had a temperature of 103° Fahr.

"Sand which had long lain undisturbed seemed more sensitive than that which had been recently in motion. Thus the first trial on any one part of the slope was always more satisfactory than subsequent ones, and the experiments of the first day were better than those of the second. That this sound is purely local and superficial, and due in the first place to friction, there is, I think, no doubt whatever. I could even produce the sound in a faint degree by moving portions of the sand rapidly forward with a sweep of my arm.

"The Arabs state that the sounds can only be heard on Fridays and Sundays, and that they arise from the ringing of the *Nakûs* (a wooden board used in place of a bell) of a monastery that was mysteriously engulfed to save the monks from the treachery of an Arab guest."

From *Jebel Nakûs* the exploring party travelled by *Tor* and *Wady Hebrân* to their old camp in *Wady Feiran*.

On the 3rd of March they started on another expedition to *Wady Ghurundel*, following apparently the coast-road by the *Nukb Badera*, the *Plain of Morkha*, and *Wady Taiyibeh*.

From *Wady Ghurundel* Captain Palmer pushed on northwards to *Jebel Bishâr*, marked on the Admiralty Charts as *Barn Hill*, and generally miscalled *Taset es Sadur*, by the *Tôwarah* Arabs, who mistake it for another mountain far away in the *Tih*. The main object of his visit to this mountain was to take observations from its summit, so as to connect by latitudes and true bearing, *Suez* and *Jebel Mûsa*.

Jebel Bishar is plainly seen from the roof of the *Peninsular and Oriental Hotel* at *Suez*, and the mountains of *Sarbut el Gemal* and *Benât* being easily seen from a great distance form a natural chain of connecting links.

I have obtained no detailed account of subsequent explorations, but in a report which I received from Sir Henry James this morning, and which was despatched from *Jebel Mûsa* on the 31st of March, Captain Wilson writes:—"The triangulation has been extended, and about 350 miles of route-survey made, including the roads to the interior by *Wadys Sidri* and *Baba*, the coast-road from *Mekatteb* to *Ghurundel*, portions of *Wadys Eth Thal*, *Useit*, *Ghurundel*, *Es Sheikh*, and *El Akhdar*; two roads from *Wady Ghurundel*, which enter the *Jebel Mûsa* district from the north; and the route from *Ghurundel* to *Jebel Bishar*. Detailed descriptions of the several valleys (he adds) will be given hereafter, but at present it may be mentioned that all practicable routes from *Suez* to the interior of the peninsula have been visited and surveyed with the exception of one south of *Umm*

Shuamer, which will be sketched next month. Notes have also been made on the water supply and vegetation in the districts examined. Altitudes have been determined by angles of elevation and depression, aneroid barometers and boiling-point thermometers.

"The hill-sketching of the survey of Jebel Serhal has been finished, and a model made by Corporal Goodwin of its most important features."

The hill-sketching of Jebel Mûsa is now in progress, and about three-eighths of it has been completed; a model of this district has also been commenced.

A large number of photographs and sketches have been taken, including views from the summits of Jebels Mûsa and Serhal. All the Egyptian tablets at Wady Mugharah, and most of those at Serâbit el Khadim, have been copied, and paper impressions taken of the most important ones. Several of the tablets are believed not to have been copied before, and one at Wady Mugharah appears to throw some light upon the character and nationality of the miners employed there.

A few excavations have been made at Serâbit el Khadim, principally with the object of uncovering fallen slabs. A few old tombs have also been opened, and drawings made, to show their construction.

A large collection of geological specimens has been made; and meteorological observations have been made at the camps in Wadys Feiran and el Deir, and also at Suez, with instruments left there under the charge of Mr. Andrews, who kindly offered his assistance for this work.

A collection of birds has been made by Mr. Wyatt, and also a small collection of insects and plants by Mr. Palmer, but he has had little time to devote to such objects.

Mr. Palmer's special work has been the copying of the inscriptions, the collection of Arab tradition and stories, the ascertaining of the correct names of places, and, lastly, an examination of the manuscripts in the library at the convent.

In each department he has done good service. Night after night he has sat round the Arabs' camp-fires writing down their stories in Arabic; and, as he has travelled along, he has lost no opportunity of discovering local traditions. They are too wild to be of much value as records, but, being all written down in Arabic exactly as related to him, they will prove an exceedingly interesting collection to the Arabic scholar, since the Arabs of the desert speak the purest Arabic. The correct nomenclature of the country is also a most important point. I doubt if much has been found to throw

light upon the route of the Israelites, but a great deal of no less useful work has certainly been done by the upsetting of many impossible theories based on errors in names. I can speak from experience of Mr. Palmer's power of distinguishing the niceties of Bedawi pronunciation.

By this time the work of the expedition has been brought to a close, and the exploring party is on its way home. They intended to break up their camp at Jebel Mûsa on the 20th of this month. They will arrive, therefore, at Suez, about the end of the month; but, as they are going to stop in Egypt to take some measurements of the Pyramids, and intend afterwards to pay a visit to Jerusalem, we must not expect them home much before the end of May.

This hasty and imperfect sketch of their work will prove at least that it has been conducted with all the energy and skill which ought to render it successful; and I am glad to be able to add, that, with the exception of the first journey from Suez to Jebel Mûsa, the exploring party have travelled entirely on foot—the only way, I believe, of satisfactorily examining such a country.

Whatever may be the results of this expedition, it will, I believe, be so far exhaustive, as regards the portion of the peninsula surveyed, that we shall feel that we know all that can be known about it; and even if we fail to lay down any one route as that taken by the Children of Israel to Mount Sinai, we shall at all events receive undeniable evidence that the character of the country does answer in a remarkable degree to what we should expect to find from the accounts given of it in Holy Scripture.

The PRESIDENT, in returning thanks to Mr. Holland for his paper, said that the subject had been put before the meeting with great ability, clearness, and modesty. The journey which it described was the fourth which Mr. Holland had undertaken to Sinai. It would appear, from what he had said, that he was merely the narrator of what other people had done; whereas, before the topographical survey by these able Ordnance officers was heard of—before Sir Henry James and himself suggested that there ought to be an accurate survey of this region—Mr. Holland had already laid down the great outlines of the country, and in previous communications had made them known to the Society. There was no doubt that an exact survey was most desirable, as it might lead to a more accurate interpretation of the narrative of Holy Scripture. He might ask Mr. Holland what extent of this region would be trigonometrically surveyed on the scale which he had spoken of?

Mr. HOLLAND replied that the two mountains Jebel Serkal and Jebel Mûsa would be surveyed on the scale of six inches to the mile; the rest of the region on a scale of two inches to the mile. It was not necessary, in a Biblical point of view, to survey the lower part of the country. There could be no Mount Sinai south of Jebel Mûsa; but it might be possible to trace the route taken by the Israelites northward from the Monat.

Mr. HOLLAND, in reply to a question by Mr. Bracebridge concerning the use of the aneroid barometer, stated that above 4500 feet they did not find

the aneroid accurate at all. They had five of these instruments working together, and they all differed; though at a lower level they all agreed.

Mr. SAMUEL WOODS said he had read with great interest, a few years back, a book by the Rev. Charles Foster, called 'Sinai Photographed,' in which was laid down a system of interpretation, founded upon the discovery that the ancient Sinaitic letters agreed very nearly with those of the ancient Hebrew, but formed words in ancient Arabic. His interpretation was extremely interesting to the Biblical scholar, inasmuch as, simply aided by an Arabic Dictionary, it professed to give an accurate description of the circumstances of the Exodus engraven by the Israelites themselves upon the rocks at the time. It would be singular if a double system of interpretation were discovered, each giving a sense widely different from the other.

Mr. HOLLAND said that on this point his tongue was tied. He had promised Mr. Palmer that he would not explain what could very easily be explained, because Mr. Palmer was himself anxious to make known the work that he had in his note-book. But he might call attention to the copy exhibited to the meeting, of a large inscription decidedly Sinaitic and Greek. The inscriptions occurred on granite, limestone, and sandstone. They were not all equally clear. Some were more weathered than others; some were made on stone with a dark external covering, so that the lighter character of the stone shone through when chipped away. Some were engraven more deeply than others; some had been washed by floods. A great number were quite as plain as on the day they were made. They had copied 2500 perfectly legible inscriptions: 12 of them were bilingual,—Greek and Sinaitic,—cut by the same hand, as far as could be judged.

2. *Journey across the Great Salt Desert from Hanfila to the Foot of the Abyssinian Alps.* By WERNER MUNZINGER.

[ABSTRACT.]

IN June, 1867, M. Munzinger, H.M. Consular Agent at Massowa, was employed by the British Government to explore the route which leads from Hanfila, on the coast of the Red Sea, to the Abyssinian highlands. This route, passing over the great salt desert so graphically described by Fathers Mendez and Lebo in the seventeenth century, has never since been traversed by any European capable of recording his impressions.

M. Munzinger had eight men with him, all armed with muskets, and he took a small supply of necessary provisions and medicines. His instruments were two watches, an azimuth compass, and an aneroid by Pastorelli. On the 10th of June he landed on the arid coast of Hanfila Bay, where there was neither tree nor shrub. The village of Hanfila consists of about twenty huts, and is ruled by a chief who remembered the visit of Mr. Salt in 1810, and whose mother, Alia, was famous in youth for her beauty, and in maturer years for great wisdom and a generous hospitality. But the people of the coast have no influence inland, and M. Munzinger had to make friends with Fridello, the principal chief of the Dumboitas,

before he could proceed inland; who, after much negotiation, furnished him with a guide.

The ground is sandy with a few coral rocks, and a hollow sound under the feet often suggested caverns. A little grass and a few mimosa trees are the only vegetation, and wells occur at long intervals. On June 18th the party crossed a ridge formed of gypsum, with pieces of shell and quartz, and veins of talc, and from its crest they obtained a view of the great salt plain, bounded on the south by the volcanic Artali Range, and on the west by the mighty mass of Abyssinian Alps. Descending for a hundred feet, they encamped on the borders of the veritable salt plain, which is marked by a line of palm-trees. Here dwell a few families of the Woyta tribe, who live on the juice of the palms, and make huts of the leaves.

The first part of the salt basin is sandy, then clay appears on the surface with crevices full of powdered salt; further on the ground resembles a frosted ploughed field, and then the bed of salt becomes thicker and presents the appearance of a lake frozen over. It was a magnificent night, and the full-moon lighted up this grand and most striking scene. The illusion of snow and ice would be complete but for the heat. The hot wind during the day was almost unendurable, —their mouths and skins were full of salt, and their half-starved donkeys moved with difficulty. After a march of several hours they came to a piece of ground surrounded by trenches and heaps, where some men were working the salt; and next day this party marched with them. It consisted of camels and donkeys heavily laden, and also of some women and girls carrying salt.

The barometer indicated that the salt basin was below the level of the sea, and it is surrounded on all sides by a high wall of gypsum. To the south is the volcanic mountain of Artali, which forms a peak whence smoke continually issues. The east side of the basin is quite dry, while the west forms a morass in its whole length, and to the south there is a lake, 6 miles long and from 1 to 4 feet deep. From the centre of the basin rise the peak of Asali and two other hills, where there is a deposit of sulphur.

The Afars, who work the salt and prepare it for exportation to the Abyssinian highlands, live the whole year round, close to the plain, under palm-trees in caverns. They cut the salt into pieces resembling whetstones, which weigh about 1 lb. each.

An oblique plain, intersected by isolated hills, conducts the traveller from the salt basin towards the Abyssinian mountains; and M. Munzinger then ascended the gorge of the Labba torrent, where

there is almost always running water, finding more and more vegetation as the elevation increased. The bed of the torrent is only 20 feet wide, and is bordered on either side by walls of slate-rock, 200 feet high. Eventually they reached Ala, on an elevated terrace, where is the salt market of the Dumhoita people. There were about 2000 people on an open space, and salt was sold for dollars and stuffs from Massowa, brought by way of Abyssinia.

The country of the Afars is bounded on the west by the Abyssinian mountains, on the east by the sea; on the north it comes nearly to a point at the end of Annesley Bay, and to the south it ends at an imaginary line drawn from Zeyla on the coast to the mountains, beyond which the inhabitants are a different people and of a distinct type.

This triangle is divided into eight regions, namely, the coast plain, 10 to 20 miles wide; a hilly country between the coast and the salt basin; the salt plain itself; the country from the north end of the salt basin to Annesley Bay, consisting of volcanic hills and plains covered with shells and madrepore; the peninsula of Buri; a chaos of high volcanic mountains to the south of the salt basin; another salt plain south of the mountains, receiving the River Hawash; and terraces rising from the salt basin to the Abyssinian mountains, by an easy ascent.

M. Munzinger is of opinion that the salt plain formerly communicated with the sea by the gulfs of Zulla and Boka, when the present peninsula of Buri must have been an island. The low elongated plains, covered with shells, point to this conclusion. The whole of the eastern drainage of the Abyssinian Alps flows into the salt basin, forming a morass, which would be a great lake if it were not for the evaporation caused by intense heat. Not a single stream ever reaches the sea on this coast.

The people inhabiting this triangular region have hitherto been erroneously called Danakil. It is true that there are Danakil, but they form only a third and the least powerful part of the population. Salt found things as they now are, but he imitated the Arabs in calling the people Danakil, without himself obtaining accurate information respecting them.

The inhabitants form, in reality, simply a number of small tribes talking the same language, and this language creates a sort of nationality. The language is called Afar, and the people, as a whole, should most properly be called Afar also. The most powerful among the Afar tribes are the Dumhoita, who inhabit the Buri peninsula and the coast, while in the mountains the market of Ala belongs to

them. The Danakil are now subject to the Dumboita, although about a hundred years ago they were the predominant tribe. The other tribes are the Dahimela, Bellesua, Hadarema, and Madeyto.

The Afar follows his own way, independent of any one else; the country is far too large for the requirements of the population, and between every village of twenty huts there intervene many miles of desert. Each tribe has a chief, called *Makaba*, who usually succeeds his father; but the most energetic or clever of the family is the successor. The colour of the people is generally black, but at the same time there are shades to the clearest brown. The features are regular, except the mouth, the lips being large and thick. The hair is short and straight, the women plaiting it like the Abyssinians. The men wear a piece of cotton as a cloak and another piece round the loins; and every man has a curved sword worn on the right side, a long heavy spear, and a shield of buffalo-hide. The women wear a leathern apron, embroidered with cowries round the loins, falling to the feet, and a few ear and wrist ornaments. Their houses are usually rude mat-tents, or conical huts of palm-leaves. Drinking-utensils are made of wood or leaves of the palm, very neatly worked. The Afars have camels, cows, goats, sheep, and asses; horses and mules are rare. The flocks and herds give very little trouble. They are in charge of the children and girls, and come of their own accord to the wells to be watered. Nominally the Afars are Mussulmans in religion and subjects of the Viceroy of Egypt in politics; but in reality they give as little to God as they do to the Viceroy. They acknowledge both, but pay no tribute to either. They neither pray nor fast.

The Afars are avaricious, obstinate, cruel, false, and very loquacious. The slightest dispute provokes blows with the knife, and murder is considered honourable. But they have some fine qualities. They pay great respect to old age, and have a profound disgust for stealing, which is an extraordinary virtue for so avaricious a people. Yet, in the whole of Africa, there is not a race more barbarous than the Afars.

The Abyssinian salt markets are five in number, at the foot of the main chain of mountains. Two are on the road to Agamé, and the others lead to Atsbi, the great central salt mart of Abyssinia. A camel carries 500 pieces of salt, a mule 250, an ass 200, and a girl 60.

Ala was the nearest point to the Abyssinian highlands that was reached by M. Munzinger, but, instead of returning to Hanfisa, he turned north and reached the coast at Annasley Bay. After travelling across one corner of the salt basin he reached the valley of the River

Ragolay, where, to his surprise, he found land covered with grass and trees, and abundant supplies of water. This is the largest stream which flows from Abyssinia to the east, draining a very considerable area on the highlands, but it is exhausted long before it can reach the sea. An arid waste of hills and valleys extends from the Ragolay to Annesley Bay, which M. Munzinger traversed during the intense heat of the first week in July.

The Paper will be printed in extenso, in the 'Journal,' vol. xxxix.

The PRESIDENT said they ought particularly to return their thanks to Mr. Clements Markham for the manner in which he had condensed this paper. A very few weeks ago Dr. Blanc told them, when he was describing the great western region of Abyssinia, that that alone was truly Abyssinia, and that the chain of mountains which the British expedition traversed under Lord Napier, and which Mr. Markham described on a previous occasion, was merely the extreme raised edge of the country. We had now an account of a third region of Abyssinia in the paper of M. Munzinger—a region which had not been traversed for centuries, and which was of great interest to the geologist as well as the geographer. The cause of the abundance of salt was this: every torrent that descended from the mountains brought down in the mud a certain quantity of salt, which was then deposited in the great hollow of the salt plain, described in the paper, from which there were no rivers to carry it off. With evaporation remained the solid salt there. Then there was a volcanic region to the south which contained much sulphur. This region was absolutely shut off from the Red Sea by a great wall of gypsum.

Mr. CLEMENTS MARKHAM said it might be worth while to mention that about 200 years ago two Jesuits were sent from Goa by the Portuguese Governor-General to attempt an entrance into Abyssinia by means of the route now described by M. Munzinger. They landed and marched until they came to the chief of a petty tribe, who gave them a guide. This guide took them the wrong way, and they were very nearly dead before they reached the valley. They described the salt desert exactly as M. Munzinger had done, and the valley they reached appeared, from their description, to be this very valley of Ragolay, which had now been re-discovered, and which had also been visited by Colonel Meriwether. They then ascended the Abyssinian highlands. A curious mistake had always appeared upon maps of Abyssinia. Fathers Mendez and Lobo, the Portuguese missionaries, mentioned Senafé as being at the head of the pass by which they reached the highlands from the salt desert. When Rüppel, the German explorer, visited Abyssinia, about twenty years ago, he came on the real Senafé. Thereupon the map-makers placed Senafé in its proper position, but they also placed it, where it had been erroneously put originally, at the head of the pass. This mistake has been continued to the present day, and, to reconcile the discrepancy, the whole region between the two points has sometimes been marked as Senafé. The salt desert is most important to Abyssinia, salt being the currency of the country. M. Munzinger advised the British to take possession of the salt-market, and thus entirely destroy the currency of Abyssinia. But a shorter way of making our presence and power felt was found, and this advice was not followed. Not only had M. Munzinger made this difficult journey, but he had also explored another route before we went into the country, and made route-surveys and observations. He had also established relations with the people of Abyssinia. He went with Colonel Grant to Adowa, and afterwards went from Antalo to within sight of Theodor's army at Dulanta, far ahead of the English force; so that, chiefly through his influence, the people

were induced to bring in supplies of provisions to our army. He deserved some acknowledgment of his services. What Government had done it was not for him to say; but he was happy to state that the Royal Geographical Society had shown their sense of his services by making him an Honorary Fellow of the Society.

Mr. THELWYSS SAUNDERS suggested that Mr. Markham might have pointed out that the error with respect to the position of Senale had been repeated improperly by the Government surveyors who accompanied Lord Napier's expedition, while it had been corrected by the private map-makers. In connection with M. Munzinger's journey, he wished to call attention to the probability of a considerable depression below the level of the sea in the region south of the salt desert. Some observations in that direction at Lake Asal, on the route from Tajura to Ankober, showed a depression of 570 feet below the sea-level. If there was such a depression extending for any distance it would be one of the most remarkable circumstances in the geography of the country.

The PRESIDENT said, if he had known that Colonel Grant had been associated with M. Munzinger, he should have called upon that gentleman in the first instance to speak in reference to the abilities of the author of the paper.

Colonel Grant was very glad to have the opportunity of adding his personal testimony to the merits of M. Munzinger as a traveller, an explorer, and a thoroughly scientific man. He had the good fortune to be accompanied by him when ordered by Lord Napier on a mission to the Prince of Tigre. M. Munzinger did the whole work of their little expedition, and did it most admirably. He had for years been associated with the Abyssinians. For ten or fifteen years he had been in that country. He thoroughly understood the people, and they thoroughly understood him. Any reward the Government might bestow upon M. Munzinger would be richly deserved.

The PRESIDENT, in adjourning the Society, announced that he had received a very interesting letter from Mr. Lamont, formerly member of Parliament for Butehire. Fortunately for science, having lost his seat at the recent election, he had thrown his whole heart into the cause of geography. He had spent 8,000*l.* or 10,000*l.* in fitting out a screw-steamer in the Clyde, which had already left Scotland, to explore the whole of the region beyond Spitzbergen, with a capital crew and a scientific man on board. All this was being done at the expense of a private individual, whilst our own Government had resolved not to expend more money in Arctic exploration. He could not conclude without asking them to return their thanks beforehand to Mr. Lamont, and to wish him God speed and great success in his undertaking.

Twelfth Meeting, 10th May, 1869.

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT, in the Chair.

PRESENTATIONS.—F. T. Mott, Esq.; W. Perkins, Esq.; Rev. Thomas Whitby.

ELECTIONS.—Capt. James George Cockburn; Thomas George Freke, Esq.; Henry Hodge, Esq.; James G. Hamilton, Esq.; John Gunt Lye, Esq.; M. J. Lindsay, Esq.; Sir John Mantell; Edward A. Phillips, Esq.; Alfred William Ray, Esq.

ACCESSIONS TO THE LIBRARY FROM APRIL 26TH TO MAY 10TH, 1869.—
G. F. Lyon's 'Attempt to Reach Repulse Bay in H.M.S. *Griper*, 1824.' Donors, the Council of the Royal United Service Institution.
Sir Vincent Eyre's 'Retrospect of the Afghan War, 1869.' Donor, the Author. H. F. Tozer's 'Researches in the Highlands of Turkey, &c.,' 1869. Transactions and Proceedings of Societies and other serial publications.

The PRESIDENT read the following letter, addressed to him by Mr. Lamont on the eve of his departure for the Arctic regions. Mr. Lamont, he added, was late Member of Parliament for Rutshire, and, he thought, had shamed our Government by undertaking what they had declined to do, and expending from 8000*l.* to 10,000*l.* in fitting out a screw-steamer to explore the North Polar regions:—

"S.S. *Diama*, Caledonian Canal,
20th April, 1869.

"MY DEAR SIR RODERICK,

"I promised to give you some particulars as to my outfit and contemplated expedition, before I finally take my leave of the shores of Britain.

"Ever since I was in Spitzbergen, in the two summers of 1858 and 1859, I have had an ardent longing to revisit that interesting country, and I have always entertained a strong opinion that by going early in the season, with a stout little screw-steamer, proper appliances, and a good crew, one might succeed in penetrating a long way into the unexplored regions beyond Spitzbergen. I always thought that the proper way to attempt this was by going well to the east of Spitzbergen, even, if necessary, close to the north-west coast of Nova Zembla, and then, if possible, working round the eastern end of the ice till you get hold of Gillies Land. Norwegian walrus-hunters have told me that they had been ashore on Gillies Land; and, although I rather doubt the truth of this statement, still there is no doubt that Gillies Land exists, and that it is a mountainous country lying to the north-east of Spitzbergen. For all that we know, this may be the commencement of an extensive continent stretching to the Pole, or far beyond the Pole; and I conceive that if we once get hold of the south-west corner of Gillies Land we may be able to screw up its west coast, keeping close to the land, for a long distance.

"I am the more inclined to believe in the correctness of my preconceived opinion that the east side of Spitzbergen is the proper route, and the best chance of finding open water, from the repeated failures of Lord Mulgrave, Captain Buchan, Sir Edward Parry, and of the Swedish expedition of last year, to effect any entrance into the ice to the north-west.

"I confess I am not very sanguine that either myself or any one else will ever be able to penetrate to the actual Pole, because I incline to believe, with Sir Leopold McClintock, that, after penetrating 100 or may be 200 miles farther than has yet been reached, we should then arrive at a prodigious wall of eternal and impenetrable ice, such as Sir James Ross discovered in the Antarctic Ocean, but it would be something even to demonstrate the existence of that.

"I utterly disbelieve in an open Polar Ocean, and I entirely fail to discern any evidence of its existence. However, I shall be very glad to find it there, and to get into it, if possible.

"My vessel is 251 tons burthen, and 103 tons register, with 30 horse-power engines. She is rigged as a three-masted schooner, with square topsails. She sails well and steams $7\frac{1}{2}$ knots per hour, with a consumption of 24 tons of coal per diem. I can stow 100 tons of coals, and I expect to eke those out in Spitzbergen by using quantities of the drift-wood which exists all along the

shores of Spitzbergen in enormous masses. I shall also endeavour to utilise the native coal, which I have seen cropping out of the precipices in various places.

"I think I have succeeded in getting together a first-rate crew, six of whom, besides myself, have had considerable Arctic experience. I have got a surgeon, Mr. Smith, who is somewhat of a naturalist, and anxious to make any scientific researches and observations in his power.

"I hope to be in Tromsø by the 1st May, which will give me full four months of good Arctic summer for my explorations.

"I am, my dear Sir Roderick, yours very sincerely,

"J. LAMONT.

"Sir R. Murchison, Bart., F.R.S."

The following Papers were read :—

1. *On the Evidences of the Gulf Stream in High Latitudes in the North Atlantic.* By Admiral C. LEMINGE, CORR. MEMBER R.G.S.

Copenhagen, April 21st, 1869.

I HAVE read with the greatest interest the discussions in the Royal Geographical Society, at the Meeting, February 8th, between Mr. Findlay, Captain Sherard Osborn, R.N., and Professor Huxley, concerning the Gulf Stream.

For nearly thirty years I have, partly myself, partly through naval friends and intelligent ship-masters, who with me take interest in oceanic currents, made observations on currents and temperatures, chiefly of the Northern Atlantic Ocean. I have always, nearly every year, furnished them with well-corrected thermometers; and these observations on the water which comes from more southerly and more heated parts of the Atlantic, and also on the waters of what I believe to be the Gulf Stream, I take the liberty of submitting to the Royal Geographical Society.

The chart which I send [which was exhibited to the Meeting] shows the temperatures between Shetland and Greenland, and the accordance existing between the many annual observations in my possession, of which I have only marked the temperatures for a few years.

According to these observations, it can be said, with certainty, that the current in the Northern Atlantic flows towards the North, even up to the Icy Sea.

In a treatise on currents of the ocean (*Havets Strømninger*; *Nyt Archiv for Sjøvidenskab*, 1853) I have published the observations, made with all possible accuracy, in one part of the North Atlantic, by seven of our men-of-war, provided with superior chronometers and other instruments; and a medium of these observations in different years gave :—

Between $59^{\circ} 30'$ and $61^{\circ} 30'$ lat. N.	} in 17 days,* the current was found 4.7
and 2° .. 6° W. of Greenw.	
Between $60^{\circ} 0'$.. $62^{\circ} 0'$ lat.	} 11 days, 2.5 nautical miles per day,
and $6^{\circ} 0'$.. $10^{\circ} 0'$ W. Greenw.	
Between $60^{\circ} 30'$.. $62^{\circ} 30'$ lat.	} 18 days, 0.8 nautical mile per day,
and $10^{\circ} 0'$.. $14^{\circ} 0'$ W. Greenw.	
Between $61^{\circ} 0'$.. $63^{\circ} 0'$ lat.	} 25 days, 3.1 nautical miles per day,
and $14^{\circ} 0'$.. $18^{\circ} 0'$ W. Greenw.	

Between 62° lat. and the south coast of Iceland, and 18° and 23° W. of Greenwich (nearly the longitude of Cape Reikjanes, south-west cape of Iceland) in 32 days, 1.91 nautical mile per day, N. 35° W. true.

Between Fairhill and Greenland, the weather was frequently unfavourable for observations for correcting the longitude, but still a constant drift, or slow current of the ocean to the north was observed, and the mean of observations between 32° and 39° W. of Greenwich gave 3.2 nautical miles per day, N. This drift of the ocean in a northerly direction towards the coast of Greenland is besides observable in the temperature of the water.

This drift, or slow current, in the Atlantic is the cause why the harbours of Norway, even farther than North Cape, and as far as the Fiord of Varanger, are accessible for navigation during the whole year; just as the warm current, which passes Cape Reikjanes, and runs to the northward along the western shores of Iceland, is the cause of the south and west coasts of this island being clear of ice, so that, even during the severest winters, ships may go to Havnefiord and other places in the Faxe Bay of Iceland, where they always will be sure of finding open sea. If this current to the north in the Atlantic did not exist, the ice from the sea around Spitzbergen would float down to far more southern latitudes than is now the case; and certainly the coasts of Norway, as well as the sea between Shetland and Iceland, would frequently be filled with ice from the Icy Sea, and the influence of the ice would then be felt on the climate of the neighbouring coasts. But this is not the case; and we know that the ice from the Icy Sea (Greenland-ice) only can force its way to the southward between Iceland and Greenland, along the east coast of Greenland, rounding Cape Farewell and afterwards passing Labrador, Newfoundland, and farther south.

Along the north coast of Iceland the current is usually to the eastward, and along the east coast predominating to south; and I think these currents may be considered as eddies of the principal currents in the Icy Sea and the Atlantic.

The current and the ice-drift of the Greenland-ice are sometimes

* I reckon a day = 24 hours.

so considerable, that not only the sea between Cape North of Iceland and Greenland is blocked up with ice, but it also strikes against the north coast of Iceland between Cape North and the Bay of Skayastrand, and then, favoured by the said eddies, closes the north and east coast of Iceland entirely. On the 24th of May, 1840, this ice was met with even about 100 nautical miles from the east coast. Still this ice never remains on these coasts later than the month of August, but generally leaves earlier, and then swings round in a north-east direction to the Icy Sea again.

The temperature of the sea seems to prove that the warmer current of the Atlantic approaches as well the east as the north coast of Iceland more in summer than earlier in the year.

It happens, notwithstanding, that a small part of that ice which now and then encloses the east coast is, by gales from north and north-east, carried to the south shore of the island; but as soon as it appears here it is carried away again with the north-westerly current from the Atlantic, passing Cape Reikianes, and thus onward to the other ice, constantly blocking up the east coast of Greenland.

The enclosed description* of the currents and ice-drifts near Iceland will give more detailed information for those who may wish it; but I must observe expressly, that the ice which now and then encloses the above-mentioned coasts of Iceland never is met with in lower latitudes, as would be the case if the current or drift of the Atlantic were not towards the north.

By studying the temperature of the North Atlantic between Shetland and Cape Farewell, it will be observed that *streaks of warmer water* are found here, some of which I have indicated on the appended sketch. These warmer streaks are not to be found every year in the same longitude, and I think they have their origin from the Gulf Stream, which has retained this higher temperature, and that these warmer streaks, sometimes met with more easterly or at others more westerly, possibly may be caused by the pressure of the current coming from Labrador, passing Newfoundland, &c.; where this current influences more or less the limits of the Gulf Stream, causing its heated water to be inclined sometimes more easterly and at other times more westerly. Severe gales might likewise possibly have an influence on this deviation.

These warmer streaks, combined with the different tropical products constantly thrown on the shores of Norway, the Farøe Isles,

* "Strømminger og Iisdrift ved Island:" a printed pamphlet, now in the Library of the Society.—[Ed.]

Iceland, Greenland, &c., I believe also to be a proof that the Gulf Stream sends its waters far to the north.

Among the tropical products frequently found is the bean of the *Mimosa scandens*, one of which I send you, and which I found on the shores of Iceland. Near Husavik (North Iceland) I once picked up on the beach so large and fine a specimen of this mimosa, that I had a snuffbox made of it.

The enclosed description of the currents will show, that Capt. Södring, in the *For* (the same vessel which Captain Sir Leopold M'Clintock commanded on the Franklin expedition), on the 7th of March, 1860, in 66° 21' lat. N., and 1° 26' long. W., found the water on its surface, after the long winter's influence in these cold climates, still at 4° R. or 41° Fahrenheit.

With all these facts it appears to me, that the Gulf Stream can be followed through the Northern Atlantic, even up to the Icy Sea.

I have limited myself to the above short report, as many distinguished Fellows of the Royal Geographical Society are so well acquainted with the currents of the ocean, that I find it superfluous to add more circumstantial details concerning this matter.

Most respectfully,

C. IRMINGER,

Rear-Admiral, Royal Danish Navy.

2. *On the Surface Temperature of the North Atlantic, in reference to Ocean Currents.* By NICHOLAS WHITLEY, C.E.

THE thermometrical observations on which this Paper is founded were commenced on the Cornish coast in 1849, and were afterwards extended to the Scilly Isles, the Seven Stones Light-ship, to Yarmouth, and to the Shetland Isles. And, further, in order to ascertain the temperature of the surface water across the Atlantic, extracts were made from the log-books of Cunard's steam-ships sailing between Liverpool and New York, for a period of five years; which have been reduced to monthly means at every five degrees of longitude, and are embodied in the table appended to this Paper.

The primary object was an endeavour to determine the influence of the Gulf Stream on the climate and agriculture of the British Isles.

In this Paper I purpose only to state the general results obtained, and to apply the evidence as a test of the existence of ocean currents.

The chart exhibited to the Meeting shows the surface temperature of the sea taken in five voyages in different years, and similar observations are given in the table at the end of this Paper.

In January the sea around the Scilly Isles is somewhat warmer than on the western coast of Ireland, and there is a decreasing temperature from 51° at the Seven Stones to 42° at Shetland, being a difference of only 9° in 700 miles of latitudinal distance. The January temperature of the water continues also to decrease down the eastern coasts of Scotland and England, until it reaches its minimum of 37° at Great Yarmouth.

We may, therefore, infer that the North Sea in winter derives its warmth rather from the strong tides which pass around the north of Scotland than from any warmer water flowing through the Straits of Dover.

The mean temperature of the sea in Penzance Bay, last January, was 50° , and between Hull and Hamburg 43° . In the same month, on the American coast, the sea is very cold, seldom rising above the freezing-point, and often from two to four degrees below it. The chilling effect of the Arctic current is felt far down the coast; but where the water is somewhat sheltered from its influence by the land of Nova Scotia and Newfoundland it rises several degrees in warmth.

The extent and greatest intensity of the Arctic current is sharply shown by the thermometer in every voyage. The cold water on the banks of Newfoundland reaches its mean monthly minimum of 36° in January, and its mean maximum of 52° in September, and its width is fully 400 British miles.

On the eastern side of the cold current, and in close proximity to it, there is a bed of very warm water having a mean temperature in January of 57° , being 27° warmer than that on the Banks, over a width of about 200 miles. This appears to be a strong eddy of the Gulf Stream, curving northward, and holding the Arctic current in its warm embrace.

From this part of the sea to near the Irish Coast the warmth is more equally distributed through the water, and the thermometer does not detect any well-defined branch of the Gulf Stream flowing to the s.e. There is, however, a decided rise in the temperature about the middle of the Atlantic, amounting to from four to six degrees above that of the sea at Scilly, and the figures on the chart appear to indicate that it lies in a s.w. and s.e. direction. It is most probably the drift of the Gulf Stream driven to the s.e. by the prevailing s.w. wind.

The observations at the coast stations on the west of Ireland

show a temperature of 3° below that of the open sea 350 miles to the west.

Our S.W. wind has its birthplace where the temperature of the sea is at least 55° in January, causing the thermometer on the Cornish coast, under its influence, to stand steadily at 52° , and the great warmth of the past winter resulted from the continued persistency of this wind rather than from any excess of heat in the sea.

The S.W. wind gives to Penzance a mean winter temperature of 44° , being the same as that of Montpellier; Cork falls short of it by only half a degree; and the Scilly Isles at this season exceed this noted winter resort by $2\frac{1}{2}^{\circ}$.

TABLE, showing the Temperature of the Surface-water of the Atlantic Ocean, at every 5° of Longitude, from the South of Ireland to the Banks of Newfoundland, on the course of Cunard's Steam-ships.

Months.	On the Banks.	Longitude West.						
		40°	35°	30°	25°	20°	15°	10°
January	30	57	53	54	55	54	52	51
February	31	54	53	52	53	52	52	50
March	32	54	54	55	54	54	52	51
April	34	57	55	55	52	54	53	52
May	34	55	54	55	56	55	53	53
June	40	60	59	58	56	58	58	57
July	45	60	59	58	59	60	58	59
August	50	61	59	60	59	60	60	59
September	52	59	59	60	59	60	59	58
October	47	59	59	56	56	57	57	55
November	44	58	57	58	59	57	54	53
December	32	55	54	54	54	54	53	52
Mean of the Year	39.2	57.2	56.2	56.2	56.0	56.2	55.1	54.2

Pennarth, Treuro, April 23rd, 1869.

The PRESIDENT, in returning thanks to the authors of the Papers, said that Admiral Irminger was a distinguished officer of the Danish navy, well-known for the interest he had taken in Arctic exploration during the time of the search for Sir John Franklin. Our own naval commanders would well recollect the kind services he then rendered them. He (the President) was proud to reckon the gallant Admiral amongst his own personal friends.

Mr. FINDLAY said he believed it an error to call the warm stream which flowed towards the western coasts of Europe the Gulf Stream; and he believed that known facts revealed some larger agent than the Gulf Stream at work in producing the mild climates of Western Europe. It was only within the last twenty years that it had been called the Gulf Stream. Rennell, Herschel, and all the older authorities, called it the North Atlantic current. The Gulf Stream, where it issued from the narrows of the Gulf of Florida, had a sectional area of only six square miles. It took about 220 days to travel from the Gulf

of Florida to the Land's End. At the outset the surface-temperature was $77^{\circ}5'$; at a depth of 1200 feet it was 55° . When it arrived at the Land's End the temperature was 51° . If this stream were continuous, as warm water, the following anomalies would have to be admitted:—Leaving the Straits of Florida in May, it would reach the Land's End in January. After an interval of ten days it arrives off Cape Hatteras, with a loss of 3° of temperature. In forty days it has lost 15° , and in fifty days the temperature is 57° . Further eastward it was 51° , then it got warmer, rising to 65° , and at last it attained an even temperature until it reached the Land's End. Taking the opposite season, the Gulf Stream, at its coldest, was 36° off Newfoundland. A strong and broad current came down from the polar basin, which cut off the northern or warmest edge of the Gulf Stream and neutralised its effects there, so that it was no longer to be called the Gulf Stream. The southern half of the stream travelled down the coast of Portugal, and there, turning to the eastward, passed round the middle basin of the North Atlantic. The quantity of water which passed through the narrows of the Gulf of Florida was 297 cubic miles per day; whereas the area which that water was claimed to cover off Western Europe was a million and a half of square miles, which would give a depth of only six inches of warm water per day. Therefore, it was not alone the Gulf Stream, but the prevalent south-westerly winds which drove the water from warmer latitudes northward to the western coast of Europe. Besides, there was the great Arctic basin, which contains another million and a half of square miles over which the so-called Gulf Stream has to prevail. The truth was, we were very insufficiently informed as to the extent of this great current; we were only at the beginning of our investigations. In our present state of knowledge he (Mr. Findlay) contended it was not the Gulf Stream that reached our shores as an uninterrupted stream of water from the Gulf of Mexico. The drifts which Admiral Irving mentioned travelled only from one to three miles per diem, and at that rate it would take the Gulf Stream hundreds of years to cover so large an area with warm water.

Captain SHERARD OSBORN quite agreed with Mr. Findlay that it was too soon to make theories about the Atlantic or any other currents. We wanted facts rather than theories. He, however, did not agree in confining the width of the Gulf Stream to the current flowing between the Bahamas and Florida, because warm water flowed up both sides of the Bahamas.

Admiral Sir EDWARD BELCHER objected to the term Gulf Stream, inasmuch as the water which came from the gulf was heated to 86° on the south side of the Caribbean Islands, whereas, as it passed Cape Florida, the temperature was down to 71° . In all parts of the world there were certain currents which had not yet been accounted for. The warm current in its passage northward refused to mingle with the cold Polar current which came down southward, and there was a line of demarcation between them like a wall, so that the bow of a ship, as we learned from the log of Admiral Milne, might be in 40° and the stern in 27° . Those who had been accustomed to navigate off the banks of Newfoundland knew that the result of these two streams meeting was a terrific hurricane. At the present moment he was engaged in ascertaining, from an examination of an immense number of ships' logs, the general temperature of the ocean, with a view to enable sailing ships to select the best period of the year for making their passages. He hoped to be prepared with a paper on the subject at the next meeting of the British Association. For instance, the Pacific was warmer than the Atlantic; for when he was in Behring's Straits at the time that the temperature off the coast of Ireland was 52° , off Icey Cape, in 70° north, the temperature was 54° . Again, he had ascertained that the temperature between Greenland and the Orkneys did not vary very much.

Colonel EVELYN said he had been struck by the great similarity that existed

between the great oceanic streams and the atmospheric currents above. It might be that they were acted upon by much the same causes. We knew little of the under-currents of the ocean, and little of the upper currents of the air. It was the upper current of the ocean and the lower current of the air that principally came under our notice; and it was with difficulty that we obtained an imperfect knowledge of the others by means of aerial expeditions, or laborious deep-sea soundings. But there appeared good reason to believe that the upper and under currents of ocean and atmosphere correspond to a remarkable extent—that the under-currents of the ocean, like those of the air, come from the Poles, and that the upper counter-currents flow back in both cases towards the Poles. The under-currents of the ocean are, in fact, analogous to the trade-winds, and the surface-currents to the reflux of the trade-winds, which, descending to the earth in high latitudes, cause our prevailing south-west winds. The water, like the air, must also be affected by the difference in the rotatory velocity of the earth's surface depending on the latitude. This must give to Polar currents, either of air or water, an apparent westerly direction, and to Equatorial currents an easterly one.

Colonel Evelyn, in conclusion, pointed out the anomaly of calling a current of air coming from the east an easterly wind, whilst a stream of water coming from the same direction was usually called a westerly current. These anomalous terms increased the difficulty he experienced in offering a few impromptu remarks about currents of air and currents of water.

Admiral OMMANNEY reminded the meeting that bottles thrown overboard in the West Indies had been picked up on the coast of Norway. He mentioned this fact as strong evidence of the course of the Gulf Stream.

Sir ANDREW WAUGH was surprised that no notice had been taken of an admirable work by Mr. Croll, in which he entered into the physical question of the latent heat absorbed by water. The effect of his book was to show that the hot water coming from the Gulf Stream was quite sufficient to carry a body of latent heat to influence our climate.

Mr. FINDLAY admitted the pains taken by Mr. Croll, but it seemed to him that that gentleman had doubled the quantity of water which came out of the Gulf, and he took no account of the period which it took the Gulf Stream to reach its point of parting, nor of the great mass of cold water which poured down into it on its northern edge and there neutralised it. It was a question for geologists whether the shoals off Newfoundland were not formed by the antagonistic action of the Gulf Stream and the Polar current at that particular part.

Dr. RAN said he had studied the action of rivers as affecting the temperature of water, and he had heard from distinguished men in the navy and merchant service that the influence of the large rivers of South America, such as the Amazon, was felt one and two hundred miles at sea. He computed the body of the Gulf Stream to be fifty times as large as the Amazon or the Rio Plata, and if that was right the influence of the Gulf Stream would account for the warm currents which flowed upon the western coasts of Europe. The cold current which was met at Newfoundland would deflect the Gulf Stream, or if the cold water penetrated it, the warm water, being lighter, would rise above it. With reference to what Admiral Ommanney had said, he himself knew that in the Orkneys fruits and plants had been picked up which only grew in the West Indies. The influence of the warm current was so strongly felt there that he adhered to the old theory of the Gulf Stream. He had calculated that the Gulf Stream brought over to our coasts a body of warm water eight or ten fathoms deep, and 400 miles in width, which, flowing in a south-westerly direction along with our warmest winds, gives a very large heating surface.

Admiral Sir EDWARD BELCHER said, with regard to drift, within this year two sea substances which existed about Teneriffe had been blown ashore at Torquay, and within the last week a Portuguese man-of-war, or *Phygadeuon*, had been cast ashore at the same place.

3. *On Open Water in the Polar Basin.* By Captain R. V. HAMILTON, R.N.

THE idea of an open sea and milder climate in the vicinity of the Pole has, at all events, the merit of antiquity to recommend it, and has been adopted on scientific grounds by many of our modern eminent geographers—amongst them Maury, who endeavours to support the conclusions arrived at theoretically, by arguments drawn from modern Arctic explorers, and the celebrated drifts of the *Advance*, *Resolute*, and *Fox*. It would, indeed, be presumptuous on my part to dispute the justness of the scientific deductions of so eminent a philosopher; but, having the practical experience of two Arctic voyages, I trust to show the deductions he has drawn from the accounts of voyages are erroneous, and would not have been drawn had his personal experience of ice-movements been equal to his scientific knowledge.

Maury's arguments* may be briefly expressed as follows:—

1. He infers† that a warm under current sets through Baffin's Bay into the Polar basin, and eventually rises to the surface and ameliorates the climate.

2. On the indications of a milder climate as shown by the migration of birds.‡

3. On the open sea seen by Penny and Kane in Wellington and Kennedy channels,§ and an erroneous idea that Kane procured subsistence for his party on the borders of this "ice-bound sea."

4. On the assumption that the drifts of the *Fox* and *Advance* were caused by "a tongue of ice 1000' long, coming out of the Polar sea formed at the edge of open water in it."||

It would extend beyond the limits of a paper to give full quotations from Maury: I will, therefore, endeavour to convey his meaning; and as it is principally with the last argument I intend to deal I shall reply very briefly to the three first.

He infers¶ from the very exceptional case of icebergs having been seen drifting north, that an under current exists which must come from the tropics, and is therefore warm.

* Eighth edition, 1867. † Para. 424-484. ‡ Jk. 425. § Jk. 428-432.
|| Jk. 431, 475-8. ¶ Jk. 424.

To this I reply that, beyond doubt, an enormous majority of bergs drift south; none have been seen to the westward of Barrow's Straits or Jones's Sound, or to the northward of the Parry Island, nor in the open sea of Kane, notwithstanding this supposed submarine current and its close proximity to the great nursery of bergs (if I may use the expression) in the head of Baffin's Bay. According to the drift of bergs, this current should be the other way; but as few are over 100 fathoms below the surface, and Baffin's Bay is probably much deeper, no argument for or against can, in my opinion, be drawn from their drift, and McClintock in December, 1857,* says, "Neither surface nor submarine currents were detected."

This warm under current may come to the surface and ameliorate the climate; but I am not aware of any cold Polar current coming to the surface and tempering the heat of tropical climates, and that cold under currents exist in the tropics is beyond dispute.

Regarding his second argument, Maury states, "The observations of explorers indicate the existence of a milder climate, which may also be inferred from the migration of birds to the northward, evidently in search of a milder climate, which can only be caused by the proximity of a large body of open water."†

In reply to this, I am not aware who the explorers are who have given practical proofs of this milder climate.

The following facts will show climate is not the cause of the birds migrating.

Ptarmigan were killed in numbers by the *Plover's* crew during their four winters in Behring's Straits. Some also at Port Kennedy by the *Fox's* crew in February, 1857, temp. 47°. Two were on Dealy Island all the winter of 1852, and shot in February.

McClintock and De Haven, during their drifts down Baffin's Bay, saw doveskins throughout the winter. Richardson mentions water-fowl, such as doveskins, wintering off Spitzbergen.

Water-fowl are always shot long before the disruption of the ice, in the cracks and lanes of water; and as most of them migrate from our latitudes to the Polar regions, it can scarcely be said they are seeking a milder climate; but, like the salmon that always returns to its native river, these birds' instinct probably lead them to return to their native haunts and open water, where they can breed undisturbed.

Regarding the open seas of Penny and Kane, and the subsistence procured by the latter for his crew in his Polynia, Penny's may be briefly dismissed, as we now know it was only a considerable space

* Voyage of the *Fox*, chap. v.

† Par. 425.

of water with an icy barrier north and south of it, which was also apparently the case in 1853-4, and is therefore probably owing to local causes, such as strong tides or currents in the vicinity of Baillie Hamilton Island, certainly not to a warmer current rising to the surface or the thermometer would have indicated it.

Kane's, or more properly Morton's open sea, in Kennedy Channel, is of more considerable extent; but from his elevation, 480 feet, the visible horizon is only 25 miles off, and it was seen at the end of June and beginning of July. What was its state in winter? Certainly frozen, for Hayes in May, 1861, found ice there, but much decayed.* It must also be remembered that Morton, although doubtless an intelligent man, was only the officer's servant, and therefore his account must be received with caution.

"Seals were sporting and water-fowl were feeding in it."† With regard to the animal life seen in this sea as a proof of an open sea, the same might have been seen in any part of the known Arctic sea where there was open water. McClintock and De Haven both saw seals, dovesies, and narwhals in the lanes of water throughout the winter. At Port Kennedy a few seals were seen in February. At the Bay of Mercy a seal was killed in midwinter in the finchale of the *Investigator*. And in April, 1854, at Beechy Island, a bear was seen digging down into a deep snow-drift, and eventually brought up a seal, probably from its cave in the snow, where it had brought forth its young. These instances will, I think, prove that an open sea is not required for animal life, and conversely the presence of animal life is no proof of a warmer open sea. I should rather say the contrary, as the unusual warmth of this ocean-climate would probably be as unpleasant to Arctic seals and walrussees, as the tropics would be to Esquimaux suddenly transported there. So far from Kane procuring subsistence for his party, as Maury asserts,‡ on "the shore of this ice-bound sea," but for the Etah Esquimaux they would have starved,§ although he had Hans, an Esquimaux, and Petersen, a Greenland Dane, in his party, both skilled and enthusiastic hunters.

In March the Etah Esquimaux had been compelled by hunger to eat 26 out of 30 of their dogs, and in 1858 McClintock heard that Hans, who had remained behind amongst them, had been compelled to eat the seal-skin which covered the framework of his kayak (the very last resource of an Esquimaux).

It is a curious fact that the coldest mean temperatures for the

* American Philosophical Society's Transactions, Dec. 1861.

† Maury, par. 422.

‡ Ib. 451.

§ Kane's Voyage.

summer months and for the year are those of Dr. Kane and Sir Edward Belcher,—the three nearest winter-quarters to the supposed Polynia,—and that they procured scarcely any game. While Melville Island and Banks' Land abound in game, and the Polynia has never been placed near them.

We now come to Maury's last argument.* To support which, he asserts that the drift of the *Fox*, *Adriance*, and *Resolute*, is sufficient of itself "to establish the existence of an open sea in the Arctic Ocean." He says,† every year a tongue of ice 1000' long is projected out of it through Kennedy and Wellington channels down Baffin's Bay, and which he supposes to drift from the southern edge of the open sea "as fast as it is formed during the winter;" and it is "the compact and cold middle ice" of Baffin's Bay, which he asserts is much heavier when first encountered to the southward than when crossing to the west coast through it in the north water. "In this fact," he says, "we recognise another argument favouring the existence of an open sea." As the southern ice was formed early in the winter, consequently had longer time to grow thick, "while that which was formed at the edge of the open water in April or March would drift out, and not attain much thickness before it began to thaw," and consequently "experience has taught the whaler to look north for the first breaking up and the earliest passage through the middle ice." If this latter argument is correct the voyage to the Pole would indeed be an easy matter, for once having rounded the northern part of the middle ice, which is never done till June, when the formation of ice is over for the season, there would be no more to encounter. But Hayes and Kane, neither of whom were much impeded by the "middle ice," tell a different tale, and describe fierce tournaments with the icy guardian of the portal to the Polar basin, in which they were worsted, although their energy and perseverance to pass through Kennedy Channel deserved the success it did not command.

A glance at the chart will show how improbable it is that such a drift as Maury imagines should occur through the narrow and winding Wellington and Kennedy channels.

I unhesitatingly assert these drifts had nothing to do with any movements of the ice in the Polar basin; as, I trust, the remarks I am now about to offer on the formation of floes and a brief analysis of the drifts will show.

De Haven in his official report,‡ speaking of being frozen in at the entrance of Wellington Channel, says:—"Sept. 13th. There was

* Par. 415.

† Par. 459.

‡ De Haven's Report.

nothing to obstruct our progress but the bay ice (*i.e.* young ice formed by the sea freezing), which with a good breeze blowing would not have impeded us much, but the wind failed. The snow, with which the surface of the water was covered, rapidly cemented and formed a tenacious coat, through which it was impossible to force the vessels. At 8 p.m. they came to a dead stand 10 miles east of Barlow Inlet.

"The following day the wind hauled to the southward and lasted till the 19th. During this period the young ice was broken, its edges squeezed up like hummocks, and one floe overrun by another, till it all assumed the appearance of heavy ice."

Again—"Sept. 22nd was an uncomfortable day, wind north-east, with heavy snow, the floes began to be pressed together with so much force that their edge was thrown up in immense ridges of rugged hummocks."

McClintock, speaking of the *Fox's* detention in Melville Bay,* says, on Oct. 3rd, "Up to Sept. 17th south-east wind prevailed, forcing the ice into a compact mass and urging it north-westward. Subsequently north-west winds set in, drifting it south, and separating the floe pieces; but the change of wind being accompanied by a considerable fall of temperature, they were either quickly cemented together again, or young ice formed over the newly opened lanes of water almost as rapidly as the surface of the sea became exposed."

Again, on Nov. 30th, he says—"For the last two months we have drifted freely backwards and forwards before north-west and south-east winds; each time we have gained a more off-shore position, being gradually separated further from the shore by fresh growths of ice, which invariably follow up every ice movement. *In this manner we have been thrust out 80 miles to the south-west from the nearest land, and into the free space which in autumn was open water.*"

These two paragraphs again refute the necessity of Maury's tongue office † thrust out of the Polar basin being necessary to account for the drifts of *Fox* and *Advance*.‡ On October 18th the young "ice three weeks old was 2 feet thick;" and on November 29th "crushed up pieces of ice 4 feet thick;" and I think the extracts I have given justify my opinion, that floes are formed all over the known Arctic regions after the middle of September, either by heavy falls of snow falling on sea-water at its freezing temperature, which form at first a thick ice-creamy substance, congealing into a solid mass as the temperature falls. Or by the sea itself freezing—gales of wind and other causes breaking this ice up, and piling floe over floe, till, as

* Voyage of the *Fox*.

† Maury, par. 477.

‡ Voyage of the *Fox*.

De Haven says, "it all assumes the appearance of heavy ice," and he might have added, the reality. The creeks, lanes, or openings thus made are again frozen over, again broken up, and so the process goes on through the long winter, in large spaces like Baffin's Bay, which is not solidly frozen over, but is always in motion. It is also to be remembered that by November this ice is 4 feet thick, and before the temperature has fallen very low—certainly not near as low a temperature as meteorologists assign to the unknown Arctic Ocean in winter, and where I see no reason for doubting that floes are being formed in a similar manner.

I now come to the drifts of the vessels.

The *Advance* was beset September 13th off Barlow Inlet, and drifted up Wellington Channel till the 22nd, when she was off Point Manning; from then till October 4th drifted but little, the winds being light and variable. De Haven * says—"All through October and November drifted to and fro by changing winds, but never passing out of Wellington Channel; for the last week of November was stationary 5 miles south-west of Beechy Island." On the 20th November, a strong breeze from the west started them down Lancaster Sound, and except that on December 7th and 8th a heavy easterly gale set them 3 miles to the westward, their drift was towards Baffin's Bay, which they entered January 1st.

The *Fox*, as I have already stated, drifted to and fro before changing winds till November 30th; was nearly stationary till December 7th, when she started on her voyage to the south, and, as McClintock observes, March 1st—"Except heavy south-east gales have drifted us backwards three times, have advanced 100 miles down Davis Straits." The remainder of her drift was to the southward.

I gather from these drifts that, when the *Advance* was first beset, she drifted up Wellington Channel to Point Manning; her drift was then up and down the channel before changing winds, but gradually making southing. It is evident there was at first open water near Baillie Hamilton Island, then ice began to attach itself to the land, and was gradually added to till the narrow northern exit was blocked up, while the wide outlet of Lancaster Sound was still open. This fast ice gradually extended and formed the thin end of the wedge which by degrees pushed the drifting pack to the eastward. The heavy easterly gale of two days' duration only drifting them back three miles, prove that there was no space for a retrograde movement of the pack; and as they felt no swell from the gale, it is evident there was a large body of ice to the eastward of them, and

* *Advance*, De Haven's Report.

which must have been formed in a similar manner to that in which they were drifting, and did not come from the Polar basin, and that the fast ice thus gains is proved by Lancaster Sound being solidly frozen over every year.*

The drift of the *Fox* was owing to similar causes; she drifted north till the fast-ice at the head of Baffin's Bay had formed, leaving no room in that direction when her southerly drift commenced; and as she also was well sheltered by ice from feeling the swell of southerly gales, it is evident that it was formed to the south of her, and could not have been drifted out of the Polar basin; and therefore the open sea at whose southern edge Maury imagines the middle ice of Baffin's Bay to be formed and drifted from, at present rests only upon theory unsupported by a particle of practical proof.

That Baffin's Bay is not, as Maury appears to imagine, one solid floe, but consists of an agglomeration of floes and fields of ice kept from permanent union by gales of wind and tidal causes, is proved by the lanes and openings seen by McClintock and De Haven during their winter drifts. It is a curious fact that, even 200' from land, McClintock speaks with surprise of the greater movements of the ice at spring tides.

Reasoning from analogy, I infer that the Polar basin, which is of much larger extent than Baffin's Bay, must consist of similar floes always in motion where there is an outlet, and therefore I doubt the practicability of spring sledge-travelling from Spitzbergen towards the Pole, and advocate the Smith's Sound route for sledge operations; and I also believe the best prospect of a ship making progress is by keeping close to the weather shore. No Arctic voyager takes the pack if he can avoid it. The facts I have now laid before you lead me to the conclusion—

1st. That there is no practical proof of a warm under current into the Polar basin, or ameliorated climate caused by its rising to the surface.

2nd. That the migration of birds is no proof of it.

3rd. The season at which the open seas of Penny and Morton were seen only shows that local causes produce an earlier disruption of the ice there than elsewhere.

4th. That the drifts of the *Advance*, *Fox*, and *Beulah*, were quite unconnected with any movements of the ice in the Polar basin, and owing entirely to local causes.

The President, in thanking Captain Hamilton for his interesting com-

* Reports of Esquimaux to Inglefield and McClintock; also crossed by Ross's and Pullen's travelling parties.

minution, observed that this Paper contained a valuable collection of facts, brought to bear with closeness of reasoning in support of the views he adopted.

Admiral Sir EDWARD BELCHER said the expedition in which Captain Hamilton was engaged under his command was in the narrow channel leading to Melville Island. In looking at the immense expanse of unknown sea on the map, one would naturally say there must be a belt of water there, and whatever a tide flowed there must be a vacancy for the tide to flow to. Beginning with Behring's Straits, which he explored in 1826 and in 1827, Admiral Smyth, who was sitting beside him, would tell them that he never saw an iceberg passing south. Admiral Kellett would tell them the same; nor had any man ever seen an iceberg passing down to the southward. But pushing farther north the next year, he was nine days under the lee of the icebergs aground in 20 fathoms.* With regard to the formation of floe-ice, he had made experiments which satisfied him that the floe-ice never formed at a greater rate than half an inch a day, and it never attained a greater thickness than seven or eight feet. In the expedition to Melville Island, which surveyed up to where Captain Hamilton met Captain Richards, the whole of that, as far as was known, was open sea. The first year, when they passed up the Victoria Channel, they stopped to build a cairn at the end of Penny's Channel, and while they were detained there the ice came in and jammed them, and thus prevented the vessels going any further. But they took to the boats and passed the ice, and there the sea was open, the ice moving by tide east and west. Next year he travelled over the same ground, and although the temperature had been 62° below zero, there were air-holes in the ice which had never been solidly frozen over during the winter. He broke into one of them, and the current was running so fast that if he had not put his arms over the theodolite legs he would have been carried under the ice. All the soundings he attempted to take at the seal-holes showed a strong current running to the westward. However, the next year, when they reached the farthest limit east on the 30th of May, the sea was perfectly open to the north, small ice flowing east and west as the tide changed, where any vessel might have navigated with ease. He was perfectly satisfied that if they had not been caught the first year by the ice they would have found their way out somewhere about Behring's Straits. Until they knew positively that there was land to the north of the lines they had surveyed, he was firmly of opinion that there was a large Arctic ocean in motion to the northward. With respect to going up by Smith Sound, if we wanted to determine how far the land trended on that line, that was the only place where it could be done by continuous land travelling; but he believed that after we got to the northward of 80° we should find that the land terminated, and that the sea travelled in a circle there, performing the same sort of gyration which was seen in the Sea of Sargasso.

Mr. FISHLAY said, with regard to the last point, namely, warm water circulating round the Arctic basin, it was well known that the water circulated to the northward along the coast of Norway; but he did not see how, with our present knowledge, the Gulf Stream could get its water into the Arctic basin. But then there was this curious fact,—how was it that the water, which was running under the same physical conditions of the rotation of the earth, should run upwards to the Pole on the eastern side of the basin and then down on

* This was determined first by soundings, next by repeated patent-log distances between it and Icy Cape. For nine days, under strong gales, it remained at 70° 40' N. to 70° 37' N., Icy Cape being well fixed in 70° 19' N. The 3-fathom bars off Icy Cape would arrest any ice I saw. On the 26th August (by my official letter) I recorded—"Lat. at noon 70° 37'; bore up N.E. by E., and stood along the edge of the ice. At 4 P.M. passed the last berg." Also, "Bergs large and scattered."

the western side? It was the case that the cold water actually ran down inside the Gulf Stream right into the Gulf of Mexico. Why it ran in that way was a problem yet to be solved.

Captain SUMMERS OSBORN thought we ought to be very lenient with the Americans upon the question of Polynias, because he remembered the time when the English had Polynias of their own, and when we had recourse to one, in order to keep alive the search for Franklin. When the expedition under the late Admiral Austin came back in 1850, they proclaimed that there was an impenetrable barrier, and that it was useless to pursue the search. Happily, there was a Polar basin discovered by Captain Penny, of Aberdeen, up Wellington Channel. It was with no *arrière pensée* that he adopted that theory. He believed as honestly then that there was a Polar basin accessible in that direction as Maury believed at this moment that Smith Sound was the entrance to his Polar basin. The expedition under the command of Sir Edward Belcher, in which he took part, put an end to that hypothesis. Since then, within the last four or five years, learned Germans had conceived that the Polar basin was to be reached by pushing beyond Spitzbergen; and he was bound to say that nothing could equal the energy and the ability with which Swedes and Germans had gone to work, though it was to the honour of those who sailed in former days, that, in spite of all modern appliances, no one as yet had touched the golden spot that Captain Parry reached in 1828. So far, then, their theory of a Polar basin had broken down. To come back to Smith Sound, he agreed with Captain Hamilton that here was a region which promised the richest harvest to the geographer and the ethnologist, and where the greatest discoveries were in store for those whose fortune it might be to be sent there. Look at the Esquimaux, for instance; they were a people cut off from all human associations, living almost in a primitive state, using the weapons, tools, and appliances, of the earliest stages of the glacial period. When we dropped theorising and were prepared to take up the question of Arctic discovery quietly and earnestly, he was convinced that we should give up the search for a Polar basin as valueless, but should find much that was important and valuable to the geographers and men of science of Great Britain.

Captain HAMILTON said he never heard of real icebergs in Behring Straits, for there were no glaciers in that quarter; and with regard to Sir Edward Belcher's open sea, the portion traversed by Captain Osborn, Sir Leopold McClintock, Captain Richards, and himself, showed no open sea in that direction. From an elevation of three or four hundred feet nothing but ice was seen; and they might as well assume that it was an ice-bound sea to the Pole, as Sir Edward Belcher assumed it was open sea to the Pole. He agreed with Captain Sherrin Osborn that the Polynia of Captain Maury was placed up Smith Sound in order to work expeditions, just as the English had formerly put a Polynia up Wellington Channel in order to work an expedition there. With regard to the formation of floe-ice, in September, 1853, in H.M.S. *Resolute*, they were in open water; a heavy north-west wind and a snow-storm came on, and at 10 o'clock at night their vessels were brought up at a freezing temperature. The snow falling into the water at the freezing temperature, formed a sludgy mass, which next day was 20 feet thick. This was the way many floes were formed; or the young ice got piled up layer after layer, and a week after the commencement of the season it had formed heavy ice. Respecting the abundance of animal life, Captain Kellett procured 325 lbs. of animal food for each man of his expedition, Captain McClure procured 304 lbs., Admiral Collinson, at Cambridge Bay, caught 1200 salmon at one haul, and Sir John Ross caught a great number of salmon at one haul. If animal life was a proof of a Polynia, Melville Sound was the place where it ought to be found; not up Smith Sound, where Kane was nearly starved, nor

near Wellington Channel, where Sir Edward Belcher never served out a fresh meal to his ship's company.

Sir LOROLD McCLECKROCK said he coincided with all the observations which Captain Hamilton had put forward in his paper: he should like to say a word as to the cause of these numerous water-spaces which were sometimes called Polynias. We never met with any of these water-spaces anywhere without also finding ample cause for them, in strong currents and tides. They were solely due to the action of tides sweeping away the ice as fast as it formed. They were common all along the coast of Greenland, and were known to the Esquimaux, who found the seals more abundant in them than elsewhere. Kane found a strong tide in Smith Sound, and it was there that his Polynia was placed, and it was there an abundance of animal life was found. Penny found strong tides in Wellington Channel, and there he also reported an "abundance of animal life." Of course, the ocean was frozen over elsewhere, and these animals sought out and congregated in large numbers wherever the sea was open, and this would account for the abundance of animal life; but it should be borne in mind that these spaces were exceedingly limited. With regard to land animals, they were more abundant in Melville Island than elsewhere, although the mean annual temperature of the island was perhaps as low as in any quarter where expeditions had wintered. He fully agreed with Captain Hamilton that nothing they had seen of late years led them to believe in the existence of a milder climate to the north. On the contrary, as far as we could see, the further we went to the north the temperature was more severe.

The PRESIDENT congratulated the Society on the admirable discussion which had taken place; a more instructive discussion he had never listened to. Their thanks were due to Captain Hamilton, and also to Sir Edward Belcher, Captain Osborn, and other Arctic officers, for the able manner in which they had marshalled interesting facts in support of their views.

ADDITIONAL NOTICES.

(Printed by order of Council.)

1. *Letter from T. K. LYNCH, Esq., F.R.G.S., on Consul Taylor's Journey to the Source of the Euphrates.*

DEAR SIR,

I have just received from Mr. John George Taylor, her Majesty's Consul at Erzeroum, the following account of the country in the immediate neighbourhood of Diadoon, and as it mentions the discovery of an active volcano, and some very peculiar sulphur springs, and enters minutely into the actual state of the country at the source of the Murat Su, or Euphrates, I have deemed the subject of sufficient interest to communicate it to the Society, particularly as the above features have not been described, as far as I am aware, by any other traveller. Texier, who travelled from Van by Ala Koo and Muree, passed too far to the eastward, and Mr. Hunt, who skirted the lake from Van to Akhlat, and proceeded from that place by the Sapin Dagh and Arifiah to Dayazged, and crossed the Ala Dagh far to the westward, over, as his account states, its highest range, where he notices the several hills which,

pouring down the northern slopes of that mountain into small basins, formed, he says, the source of the Euphrates; so that neither of these celebrated travellers, one passing to the westward, the other to the eastward, noticed the country now for the first time described by Mr. Taylor, who fortunately determined on a new path, an intermediate one, which he found extremely interesting, particularly in the immediate neighbourhood of Diadecm.

After visiting every place of interest round Lake Van, Mr. Taylor struck out an intermediate route, direct between Diadecm and Begir Kalah, an old Armenian town, on the hills to the northern extremity of Lake Van; the road was good throughout, and the country on either side, though without trees, exhibited fine pasture and grass lands; half way to Diadecm, he came upon an active volcano, called the *Seanderlik Dagh* (oven mountain), not mentioned in the maps. Smoke was coming slowly out of the crater, and a rumbling noise was heard in the earth, reminding one of the portentous groans which, as is reported, preceded the great rupture of Vesuvius when Herculaneum was destroyed.

The volcanic formations about Diadecm were found to be extremely curious. The whole bed and valley of the Murad Su there is full of active sulphur geyser, too hot for the hand, some of them quiescent, and others burst up to the height of some eight or ten feet, every now and then subsiding as suddenly as they burst forth. At one place close to Diadecm, and to these sulphur springs, the Murad Su flows through a natural tunnel, at the top of which were seven or eight sulphur springs, which, as they overflow and run down the slope into the Murad Su on the south side, form sulphuric and saline deposits, which have become *minshsten* and rocks, easily cut with a knife. Close to these rocks other springs of hot water form beautiful stalactites and petrifications in all kinds of colour and form. The stench and steam, however, at this point are most disagreeable, formed by the boiling sulphurous stream flowing down the sides and mixing with the cool clear water of the Murad Su fifty feet below. The main sulphur source was originally lower down the stream and in the plain, but the severe earthquake we had at Erzeroum three years ago effected a perfect change, the latter source having dried up, and those above mentioned having taken its place, and consequently the formations formed by these springs, which bulge out in irregular masses down to the river, date only from that period.

Passing through the tunnel, the river occupies the centre of a deep basalt gorge, with steep perpendicular sides, composed of irregular blocks of that stone from the mountains of the Ala Dagh. The gorge looks like an artificial ditch, purposely constructed to defend the small plain of Diadecm.

2. *Notes on the Burmese Route from Assam to the Hoochoong Valley.*

By HENRY LIONEL JENKINS, Esq.

(Communicated by F. A. GOODENOUGH, Esq., F.R.S.E.)*

WISHING to satisfy myself as to the practicability of opening out the old

* Extract from Mr. Goodenough's letter.—"Calcutta, 9th February, 1869. Dear Sir,—My friend, Mr. Henry Lionel Jenkins, has recently accomplished a trip to the top of the Patuk range, which divides Upper Assam from Upper Burmah. Mr. Jenkins performed the journey in the hope of the sanction of the local Government here being granted to an exploration of the country between Assam and China, and in the general interests of science. The Patuk range is very little known, but few explorers having ever surmounted its height; amongst whom I may mention Mr. Griffiths, in 1857, who went from Saddy to Bhamo and

Burmese * route from Assam into Upper Burma, I started on the 15th of last month from Makoon, the last outpost in that direction, and travelled along the old path as far as Lake Nonyang, on the south side of the Patkoi range. The following notes of the trip may perhaps prove interesting to persons connected with Assam:—

December 15th.—Started from Makoon in the morning. There is no road eastwards or southwards beyond this point, except the natural bed of the Dehing River. It is necessary to cross the river at every bend: this is not difficult at this time of the year; there is not more than two or three feet of water at the outside. Encamped at night at the mouth of the Terap River.

16th.—Continued to travel up the bed of the Dehing, and camped at night at a small Singfoo village a short distance below the Kerrimpane, on affluent of the No Dehing River.

17th.—Reached the new Beas of the maps. Bunka, the most influential chief of the Assam Singfoos, lives here. He accompanied me across the Patkoi.

18th.—Camped at night at the mouth of the Dicspane, another affluent of the No Dehing.

19th.—Continued up the Dehing, and camped at night at the mouth of the Namchik River.

20th.—Above the confluence of the Dehing and Namchik rivers the main river is called the Namroop. This day we travelled up the Namroop, and camped a little below Soukaph Parbat.

21st.—Continued up the Namroop, which here runs through a narrow gorge between Soukaph Boom† and Mising Koo; camped at night at the mouth of a small stream called Namgoi.

22nd.—As I found much time was lost in dragging my two small canoes over the rapids, I resolved to leave them behind; and, loading my baggage on my elephants, marched up the stream of the Namroop till I reached the Namphook village, which consists of eight Singfoo houses.

23rd.—As this was the last village I should see, it was necessary to lay in a stock of provisions. This day was spent in bargaining for rice, and in arranging with the able-bodied men of the village to accompany me as guides. I had some difficulty in arranging with these men. It was necessary that they should consent to act as porters, if required, and Singfoos have a particular objection to carrying loads for other persons.

24th.—Started from Namphook village, course due south, across the Namroop, over some hilly land, covered with forest, two hundred feet higher than the bed of the river. After a two hours' walk we came again on to the Namroop, and waded up its stream till the evening, leaving the bed of the stream now and then at the bends of the river, in order to keep as straight a course as possible.

Both banks of the river were covered with a forest of immense timber-trees, and underneath the larger trees was a rank growth of jungle, through

AVA; Captains Hannay and Burnett; whilst Lieut. Wilcox (1837) went due east from Suddya, or nearly so, and thus never touched the Patkoi range at all. I do not remember ever having heard of the Nonyang Lake before. I do not think that previous explorers speak of it; but perhaps the records of the Society can give information on this point. You will observe that Mr. Jenkin's route was far to the east of that pursued by Mr. Griffiths (1837). There is another pass to be found by following the course of the Namchik River, and there are others farther to the west and south-west, by one of which the Burmese army crossed in 1829, as marked in my map deposited with the Society by Sir Andrew Waugh."

* See Wilcox's survey map.

† In Singfoo, Boom is a mountain; Koo, a hill.

which we could not have made our way except for the tracks of wild elephants. Along these tracks, when it was necessary to leave the bed of the river, we could walk very well, and with a little cutting of the creeping and climbing plants, the ponies could be made to follow, but the tracks were neither high enough nor broad enough to admit of elephants with their loads passing along them, so I sent back my elephants to the village, taking on as little baggage as possible, partly carried by the Singfoes and partly by the ponies. The Namroop was for the most part shallow, but occasionally we came on very deep pools of very clear water. The quantity of fish* in these pools is astonishing. The Singfoes speared a great number during the day-time.

Camped at night on the banks of the Namroop.

25th.—Continued our march up the Namroop much in the same manner as on the previous day, striking occasionally into the jungle to avoid going out of our course, which was still south, until we reached the mouth of a small stream called Nambong, when we left the Namroop, and waded up the Nambong to the mouth of a still smaller stream. Up this latter stream, the Nunkes, we travelled till evening, and encamped on its banks.

The country, during the early part of the day, was undulating, and gradually became hilly. The principal rock was a soft blue slate; occasionally a thin stratum of sandstone appeared. The strata were faulty, and in some places very much tumbled.

26th.—Continued to walk up the Nunkes with slow uncertain steps, for the bed of this stream is composed of large round slippery boulders. After travelling about an hour up the stream we left it, and commenced the ascent of the Patkoi by a narrow and not very well marked path. The ascent was not steep; the ponies had no difficulty, except when we came to a fallen tree or some other obstruction caused by the living jungle. The path was very nearly straight; there was hardly any attempt to lessen its steepness by altering the direction. As we ascended, the forest trees seemed to improve in size, and the undergrowth of jungle to be less thick. Of the timber trees common to Assam I particularly noticed the Sawt and the Mekahi. These trees average at least twelve feet in girth; the latter, a noble tree, grows to the height of sixty to seventy feet without a branch. On the summit I found a good deep soil covered with bamboos, canes, and forest trees growing luxuriantly, but not so rankly as in the plains below. Many of the plants and trees were common to the plains; others were new to me, particularly a cane bearing an edible fruit, which I do not recollect having seen before. I found the tea-plant abundant on both sides, but more plentiful on the southern than on the northern slope. The Singfoes gathered the leaves, and commenced to prepare tea after their own fashion. They told me that tea was to be found in the jungle near any spot where there had formerly been a Shan or Singfoe settlement. As far as I could see, there is a dip in the Patkoi range at this point, and it is to be supposed that the Burmese would not have selected this for their main route to Assam unless it had possessed considerable advantages over every other path. The present path rises probably from 2500 to 3000 feet, but to cross the range with a road it would certainly not be necessary to rise more than 2000 feet.

On the Assam side I could see little but the tops of the hills below me, on account of a heavy fog; but southward the air was clear, and I had a very fine view of the country. The most striking object on the Burmah side is a large open plain, dotted with a few trees, some eighteen or twenty miles long, by seven or eight broad. At the western end of this plain, and almost imme-

* If this route is opened out, the immense quantity of fish in all these rivers may prove of economical importance. The most numerous are *Cyprinus hyacinthinus*, *Barbus marmoratus*, and *Barbus laccanolepis*.

† *Artocarpus Chaplasha*.

diately beneath the Patkoi, is an open sheet of water, perhaps three miles long, and exceeding a mile in breadth, called Nongyang* by the Singphos. The lake stretches nearly from east to west. It contains a triangular-shaped island near its south-east extremity, where its waters are drained off by a small stream called Loglai, which running southwards, falls into the Sooroung, and this latter river falls into the Denai, or Kyendwen of the maps.

The Kyendwen, it is well known, falls into the Irrawaddy, or Milce, as the Singphos call the great river below Ava.

After examining this lake, and satisfying myself that its waters did run southwards through the Loglai, I returned to the top of the Patkoi and encamped there. I was anxious, if possible, to get a view of the Assam side, so as to gain some idea of the best line of road to Makoon. The nearest of the Hokoong villages are on the banks of the Sooroung, lying under a hill called Galsak, which was pointed out to me, and which appeared to be about twenty-five miles south of Nongyang as the crow flies. In the evening two Singphos came into our camp from these Sooroung villages, and I learnt with surprise that they had slept two nights on the road since they left their homes. They had travelled up the bed of the Sooroung, and then up the Loglai. The devious course of these streams, and the difficulty of wading over shingles and boulders, must account for the slow progress made.

The villages on the Sooroung, they informed me, did not number more than fifteen houses, and that very little rice would be procurable. From their villages to the Denai is a two days' march through forest. They described the country on each bank of the Denai as well cultivated and thickly populated. From the Patkoi to the Denai the path did not lie over any steep hills.

The Singphos who accompanied me had only agreed to take me as far as Nongyang, and I failed to induce them to go farther south with me. It was their busiest time of the year. The only crop they grow was being reaped, and they could not afford to lose any more time in securing it.

It will be seen that the only difficulties to be encountered on the road between Assam and Hokoong are caused by the denseness of the jungle. The intervening country is a wilderness, consisting of a forest of many useful timber trees of immense size. Below the larger trees is a tangled mass of smaller plants, most of them climbers, twisting about the larger trees, and wrestling with each other in an intense struggle for life. The only paths by which man can move are the natural beds of rivers or mountain streams. It would be impossible to leave these channels except for the tracks made in the jungle by herds of wild elephants. Progress along such paths is very slow, and the distance to be travelled very much increased, owing to the necessity of often following the windings of the streams.

The Burmese Government in former days took care that there should be a village, or rather a military settlement, every twelve or fifteen miles along the route; and it was the business of the people living at these stations to cut the jungles occasionally, and to remove fallen trees and other obstructions from the path. The route has now fallen almost entirely into disuse, on account of the posts having been one by one deserted. Since August last only three trading parties have come this way from Hokoong into Assam.

Traders now usually travel by a more circuitous and very difficult path through the Naga hills, passing from one Naga village to another so as to obtain supplies. It is to be wondered at that the Namroop route should be used at all by traders, considering that each man must carry fifteen pounds weight of rice for his own consumption on the journey, besides his load of

* Nong, a lake; Yang, the name of Shan chief, who held this post for the Burmese.

goods: but the Moolook Singfoos and Doonlahs* are not hill-men, and, to avoid climbing the steep scarp which the Patkoi presents at every other point, they form depôts of provisions along this route, much in the same manner that the later Arctic explorers have adopted in their expeditions on the ice. They carry forward rice, and bury it at convenient intervals along the road, and then return for their loads. What is wanted is about ninety miles of road from Makoon to Kyendwen. There is a sufficient amount of Naga and Doonlah labour to be obtained in this neighbourhood for the construction of an ordinary "cutcha" road, and the cost of it would not exceed one thousand rupees per mile. Such a road would enable the trader from Hookoong to reach Makoon in one-third the number of marches that the journey now occupies, and it would render an examination of the country easy, and thus pave the way for a more scientifically constructed road or a railway.

On my return I fell in with a party of eight men returning to Hookoong. They had brought over amber ornaments and ivory for sale. Two of the party were taking back about thirty yards each of the poorest description of calico,† and another had some sulphur. The rest had invested in opium.

These men mentored me that there was more than one well-used trade-route through Moonkoong, and through the Lepahce Singfoo country to Tali and other places in Western China. The question of opening up China to India is of so great importance that it is not likely to be lost sight of now that it has once attracted attention, but the magnitude of this subject should not make us pass over the value of improving the communication between the Brahmaputra and the Kyendwen. The great want of Assam is population to cultivate the soil. We can obtain labourers from Bengal, but we have also to a great extent to import their food, and this in a notoriously fertile country.‡ That Bengalees have not settled to any extent in the province is, no doubt, a good deal owing to the illiberal policy of Government with respect to the selling or leasing of waste lands; but it is also in part owing to the fact that the climate does not suit most Bengalees on their first arrival in the province. If Assam is to be re-populated, it will be from the East. That the existing population has been mainly derived from this quarter is shown by the language, customs, and physical appearance of the people. At the present time the Phakial, Doonlah, and Singfoo population is increased annually to a small extent by the influx of emigrants from Hookoong and the Shan States. That people do not come in greater numbers is, I believe, entirely owing to the hardships that persons reared in a cultivated country and unaccustomed to the jungles must encounter on the road. It is said that numbers of persons who leave Hookoong for Assam never arrive here. They lose the path, and, wandering about in the jungles, starve to death, or are killed by wild animals.

I do not know what difficulties there would be in obtaining a right of way from the Burmese Government, but through considerably more than half the distance the road would be in British territory, and the opening up of a road only as far as the watershed of the Patkoi would prove of no small value to the province.

* The Doonlahs are the descendants of Assamese, who were taken into slavery by the Singfoos and Burmese, and Phakials.

† I am not sure about the name of this cloth. It is composed chiefly of starch, with a small portion of cotton to give toughness to the fabric. It is never seen in any civilized place; but the Manchester manufacturers know well how to suit savage customers, who must have cheap clothing and do not wash their clothes.

‡ The ground is cropped year after year, and no manure is used, yet the yield is on the average about 45 cwt. of paddy to the acre.

3. *Notes to the 'Journey from Ningpo to Shanghai.'* By CHRISTOPHER T. GARDNER, Esq., F.R.S.E.

NOTE I.—ON COTTON CULTIVATION IN CHINA.

PERHAPS a few remarks with regard to cotton cultivation in China, and the Che-kiang province particularly, may be of interest. Before the American war had made raw cotton a desideratum in Europe, and before our last treaty with China, entailing a rapidly increasing demand for cotton fabrics, the raw material was not much cultivated in China, and it even formed an article of import. The American war, however, raising as it did the price, made the cultivation of cotton a most lucrative species of agriculture in China, more especially in the northern provinces, where the crop, by its long staple, is most suitable to our English machinery. Large crops there, and in the central provinces of the sea-border, created a demand for it in the western provinces, which are more suitable for other cultivation. In Che-kiang especially, land utterly devastated and laid waste by the rebellion has been devoted to the growth of cotton until last year, when, though all calculations must partake more of rough guesses than of reliable estimates, I should imagine there were over 100,000 acres planted with cotton, yielding a crop of about 25,000,000 lbs. In 1886 the Cotton Supply Association sent about 1 cwt. of Egyptian cottonseed to be planted in this province as an experiment. Unfortunately it was a complete failure, and for many reasons:—1st. The quantity of seed was not sufficient for a fair experiment. 2nd. It arrived in a very bad condition. 3rd. The climate of Egypt does not in the least resemble that of the province of Che-kiang. What I would suggest is that the trial should be made on a much larger scale with New Orleans seed, carefully packed, and that the mode of cultivation in use at New Orleans should be likewise imparted. Land in this province is principally cultivated by small proprietors, and is generally hereditary property, held in trust for the benefit of all the members by the head of the family. Chinese law puts every obstacle in the way of the alienation of land from hereditary owners, and, as primogeniture is not in vogue here, every Chinaman has a plot of ground, or rather share in a plot, belonging to his family or clan. The few large landed proprietors in the province do not farm their own ground, but sub-let it in very small lots. Hired agricultural labourers are very few, since the members of a family all work together on land in which they have a common interest, communism of property in Chinese families being carried to an extent wholly unheard of, I believe, in any other nation of the world; when, however, labourers are hired, they receive ordinarily the following wages:—By the day, 1s. 3d.; by the month, 25s. This, of course, refers to strong-bodied men for ploughing, &c., and even they have to buy their own food. In the cultivation of cotton, hired labour is almost unknown: the watching the crop, the picking the cotton, &c., being performed in nearly every instance by the female portion of the owner's family, while the men are engaged in the more disagreeable and laborious work of the paddy fields.

With regard to the quantity of labour available in this province, it is unlimited. The Chinese, though a contented and happy people, among whom pauperism is an unknown thing, live in unhealthy huts, and feed most sparingly. The reason of this being that, in spite of the natural industry of the people, this province is over-populated, and there is not work enough for them to do. The annual rent of land, including Government land-tax, is about 4l. an acre. A very slight injury is done to cotton by a sort of locust or cotton fly, and none, I believe, by worms. As far as I know, the only way that the injury done to cotton by locusts is attempted to be obviated in this province, is by keeping a child in the cotton-fields to drive the insects away in June, this being the only

time when their ravages are of importance. After June the cotton-fly either disappears or finds the cotton-plant unsuited to its palate. Other causes of injury to the cotton crops are the overflowing of the river and consequent swamping of the low-lying fields. (It is not, according to the Chinese, the salt, so much as the moisture, that spoils the crops.) Strong winds, at the time of the flowering of the cotton, occasionally make great havoc; and lastly, heavy rains, which fill and rot the cotton. These climatic influences are provided against by a reference to the almanack and the choice of a time for sowing the seed, so that the plant may be in such condition at the time of their occurrence as to receive as little injury as possible. Many of the weather prophecies of the Chinese almanacks are as unreliable as those of Zaddiel, &c.; but recorded observations of many centuries of weather, and the Chinese system of lunar months instead of solar (the moon affecting, as it does, the tide and weather more than the sun) gives the Chinese prophecies, with regard to rain, &c., far greater correctness than such prophecies possess elsewhere. In the beginning of May, the cotton cultivator, having consulted the almanack as above explained, and taken the advice of a fortune-teller as to a lucky day and one likely to appreciate *feng shui* (influences of geomancy), sows the cotton-seed. In five days the seed sprouts. In the end of May the cultivator covers his field with a mixture of wood-ash. In August the plant flowers, and it is ready to be gathered in September or October, after which the ground is refreshed by having beans planted on it. Cotton is never grown on the same fields as rice, hemp, corn, and the egg-plant, are used to alternate cotton crops, though cotton is often grown several years successively on the same land. The best cotton in this province grows on the low plains, and is manured by what the Chinese call "vegetable cake," that is, decayed plants pressed into a cake about 8 feet in circumference and 4 inches thick, the addition of a little oil giving the cohesion necessary for its convenient transportation. The Chinese idea is that one man can work about an acre of cotton. The cotton grown in this province is chiefly for export to the western provinces, and is shipped' unpressed in spite of the heavy expenses of freight, since the primitive nature of the Chinese machinery renders it difficult for the natives to work pressed cotton. Besides the cotton exported, a large amount is used for local consumption.

NOTE II.—TRANSLATION OF THE CHINESE 'GOVERNMENT GAZETTEER' WITH REGARD TO THE ORIGIN OF THE KIANG SEA-BARRIER.

Various dynasties have been engaged in constructing the sea-barrier at Chien tang, Yen lie and Ning hai, in the prefecture of Hang-chow. According to the *Ti li chie* geography book, published in the time of the Tang dynasty, a salt commissioner put up the road on the top of the sea-barrier for 224 li. It was the first year of Kai Yuan that it was again made. (N.B. The *Liang chu yin fu*, which states with regard to the expression "again made," that it is evident the work was not begun in the first year of Kai Yuan; when the work was begun there are no means of discovering.) According to the *Liu lin* records, a book of the Hsien Shun reign, the Hang-chow people for a long time suffered from the river being affected with the sea-tides, when, at the time *Pai lo tian* was sub-prefect, two or three *Wên chang* were written and presented with prayers to the spirits of the river, setting forth that human force was of no avail. That previously to this, in the time of the Chang dynasty, in the eighth moon of the fourth year of Kai ping, Ch'ien Prince of Wu-so, was the person who first built the river-wall outside the ancient Hon Ch'as and present Lung Chiang gate (of Hang-chow), as the tide beating up by night and day, the (previous) wooden breakwater had proved of no avail, so he ordered several hundred men with powerful catapults to shoot at the head of the tide; meanwhile he earnestly prayed at the Hsu-shan-shu, and wrote a

poem, which he closed and sealed, and placed in the Hai-nun-shan (Sea-gate-hill); that after this the tide retreated from Chien tang and went just to Szu-ling. He immediately made a bamboo frame-work, which he filled with large stones, and planted therein great trees, which thus made an efficient sea-wall. After some time had elapsed, the city of Hang-chow was built. Chu-lo, which is the same as the present Ping-lo, was at that time part of the river. The 'Ho chü chü' (record of rivers and creeks), a book of the Sung dynasty, states that the Chi River joined the sea, and daily received two sea-tides; but that in the time of Kai-ping, of the Liang dynasty, Chien Prince Wu-so commenced to prevent the encroachment of the sea by making a sea-barrier outside the Hou chao mên of Hang-chow. The barrier and bank being solid, the people dwelling there were at ease. At the time of Ya Chiang, of the Sung dynasty, in the fifth year of Chiang-fu, the Hang-chow people reported that the tide of the river Chi had broken down and destroyed the west and north barriers, and the flood was but very little way from the city. The people were in a fright, so officers were appointed, namely, Chieh Lun, sub-prefect of Hang-chow, and Chen-Ya, salt commissioners, to devise means of protecting the bank. Chieh Lun and the others took soldiers and felled timber in order to protect the bank from the breakers. In the seventh year (of Chiang-fu), Chieh Lun, &c., departed, and in their place were sent the salt commissioners Lo Fo and the palace officer (eunuch) Lo Shieh Ch'ing, who, considering that the thing was not as it ought to be, requested that the ancient plan of Ch'ien might be resorted to, viz., of piling and filling in bamboo framework with stones. In order that the barrier might be solid, stakes were piled, the barrier was increased, and made for 7 li, at which there were several myriad workmen required for the collection of the materials. Next year the work was finished, and was perpendicular from ridge to base, in order to stop the force of the tide so that not even the bores, which are several tens of feet high, could do any injury. At the time of Chiung yü it is stated that the stone bank of the Chi River, not having been repaired for a long time (got out of repair), and people feared they would be drowned. Chang hsia, Assistant Secretary of the Board of Works, was accordingly deputed to look after the affair; he ordered the military officers and soldiers who were stationed about the river to collect stones and material for mending the barrier. Wherever it was broken there he mended, so all the people were in security. For this the men of the neighbourhood erected a shrine to him, and the Emperor also rewarded his merit, and bestowed upon him the posthumous title of Ning Chiang how (Earl of Ningpo River).

According to the 'Yü hsien ching chuan' (Life of Yü hsien ching), a book of the Sung dynasty, while Yü hsien ching was Counsellor to the Emperor, and one of the tutors in the Imperial Palace was Prefect of Hang-chow, a mighty storm arose, and the tide of the river broke the barrier; he sent a multitude of troops to dig in the western hills, and made a bank of several tens of li in length, so that the people were at ease. The 'Wang li Häng Chow foo chieh' (the records of Hang-chow, published in the time of Wan-li) states that, in the third year of Ching-yuan, an Imperial edict was issued highly praising Yü hsien ching, &c.

1.—TABLE OF OBSERVATIONS FOR HUMIDITY IN THE PESTICILLA OF SINAL. By the Rev. F. W. HOLLAND, F.R.G.S.

Date, &c.	Place.	Anemids.		Bathing Water.	Temp. Tube.	Result of Observations.		Mean of Observations.
		Index.				Anemids.		
		No. 104.	Private H.			No. 104.	Private H.	
		0-071 -	0-385 +					
1897.								
Nov. 1 at 1 P.M.	J. Catharine	31-925	31-675	196-5	42	5939	8702	8055
" 2 " 1.10 A.M.	J. ed Dair	33-475	33-125	199-25	58	6874	6811	7068
" 3 " 3 P.M.	J. Miss	32-55		199-0	52	7460	7413	7413
" 7 noon	Head of W. Sebadyeh	34-45	34-05		71	5908	5865	5867
" 8 " 11 A.M.	J. Umm Shawmer	32-30	31-925	197-5	57	8302	8286	8321
" 13 " 11.30 A.M.	J. eth Thicht	32-675	32-375	198-0	59	7917	7748	8049
" 16 " 11 A.M.	J. Abu Mas'ud	33-45	33-20	199-5	42	6934	6771	7041
" 22 " 3 P.M.	J. Sana	33-85	33-525	201-0	63	6981	7772	6359
" 27 " 4 P.M.	J. Aljodh	33-625	33-550	200-5	65	6925	6633	6601
" 27 " 1.30 P.M.	J. Umm Alowes	33-45	33-25	200-0	66	7031	7439	7103
Dec. 1 " 11 A.M.	Pass at head of W. Sigillyeh	33-05	34-70		50?	4975	4380	4382
" 1 " noon	J. Serhal, E. peak	33-60	33-525		55?	6020	6025	6007
" 14 " 10.30 A.M.	J. Um Zayreg	37-10	36-55		60	2948	2972	2910
" 19 " 11.45 A.M.	J. Sahara	35-75	35-45	204-25	67	4962	4217	4664
" 23 " 4 P.M.	J. Zib eb Babair	35-75	35-50		40?	4120	3926	4023
1908.								
Jan. 13 " 2 P.M.	Top of Nubb Hathara	37-25	36-80		45?	3722	2737	2729
" 20 " 6.45 A.M.	Alm es Sufah	39-30	38-80		44	6571	6921	6646
" 21 " 9.15 A.M.	Alm el Alya	37-85	37-40		62	1038	1073	1065
" 22 " 8.45 A.M.	Alm el Akhar	36-15	35-80		50?	3779	3745	3747
" 24 " noon	J. Oulmeh, centre peak	34-90	34-65		50	5380	5166	5273
" 27 " 1 P.M.	J. Oulmeh, E. peak	34-80	34-55		50	5258	5052	5105
" 27 " 2.15 P.M.	J. Tula	34-90	34-70	198-0	58	7032	7333	7670
Feb. 4 " 0.30 P.M.	J. Serhal, centre	33-60	33-40		59	6467	6222	6344

Computed and Tabulated by Staff-Commander C. George, R.N.

PROCEEDINGS
OF
THE ROYAL GEOGRAPHICAL SOCIETY.

[ISSUED JULY 20TH, 1869.]

SESSION 1868-69.

Thirteenth Meeting (ANNIVERSARY), 1 P.M., May 24th, 1869.

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT, in the Chair.

THE rules which govern the proceedings of the Anniversary, and the Minutes of the last Annual Meeting, having been read, W. Bellaert, Esq., and A. Keith Johnston, Esq., were chosen by the President as Scrutineers of the Ballot, for officers of the Society presently to take place.

THE Report of the Council for the past year having been read by the Secretary, Mr. C. R. Markham,

Capt. BEDFORD PIM, R.N., rose to express his regret that the Report contained no allusion to the prospect of obtaining, with the large fund now disposable, a building to contain a Hall of Meeting and Offices for the Society. He wished to read a letter which he had last week addressed to the President on the subject.

THE PRESIDENT ruled that the step now taken was out of order, and calculated to lead to a general discussion interrupting the business of the General Meeting.

Dr. WEBSTER then moved, and the Hon. E. KINNAIRD, M.P., seconded the adoption of the Report, and the motion was carried by the Meeting; an amendment, proposed by Capt. PIM and seconded, meeting with three supporters only.

THE PRESIDENT then delivered the Royal Medals for the encouragement of geographical science and discovery. THE FOUNDER'S MEDAL to Prof. A. E. NORDENSKIÖLD, for having taken a leading part in the conduct of the late Swedish expeditions of discovery and scientific investigation to Spitzbergen and the neighbouring seas. THE PATRON'S or VICTORIA MEDAL to Mrs. SOMERVILLE.

for having devoted a long and well-spent life to the production of works which have strikingly illustrated geographical science. His Excellency the Baron de Hochschild, Swedish Minister, attended to receive the medal on the part of Professor Nordenskiöld; the medal for Mrs. Somerville was received by the President.

The President next proceeded to the distribution of the Prize Medals, granted by the Council to successful competitors among the chief public schools of Great Britain and Ireland. He stated that the Council had adopted this scheme of Annual Prizes with the view to encourage the study of geography. He would call upon Mr. F. Galton, one of their Vice-Presidents, who had the merit of having originated the scheme, to explain in a few words the results of the examination for this year.

Mr. F. GALTON explained that the number of schools invited by the Council to compete for the medals was thirty-seven, including all the great public schools of the United Kingdom. Out of these, twenty-one accepted the invitation, contributing in all thirty-nine competitors for the prizes in political geography, and forty-two for those in physical geography. The results of the examination were as follow:—

POLITICAL GEOGRAPHY.—(Examiner, the Rev. W. G. Clark, Public Orator of the University of Cambridge):—*Gold Medal*, Henry C. Richmond, Liverpool College; *Bronze Medal*, James Dearden Wilde, Manchester Grammar School. Other Candidates who were considered deserving of Honourable Mention:—Edward Crabb, Manchester Grammar School; James Henry Collins, Liverpool College, and — Lewis, City of London School, equal; Harold Bailey Dixon, Westminster School; Douglas Samuel Bontflower, Rossall School. PHYSICAL GEOGRAPHY.—(Examiner, Alfred B. Wallace, Esq., F.R.S.):—*Gold Medal*, William Grundy, Rossall School; *Bronze Medal*, George William Gent, Rossall School. Other Candidates who were considered deserving of Honourable Mention:—George Grey Butler, Liverpool College; Martin Stewart, Rossall School, and Alexander Stoddart Wilson, Glasgow High School, equal; Gerald Baldwin Brown, Uppingham School; Ernest Chester Thomas, Manchester Grammar School.

Mr. Galton had further to state that the performance of fully one half of the candidates was considered by the Examiners very creditable to their zeal and industry; and he would add that the performance of the gold medallist in political geography was worthy of exceptionally high praise. The Council, instructed by the experience of their first attempt, would issue, as soon as practicable, revised conditions for the Examination of the year 1870.

Mr. HENRY C. RICHMOND, of Liverpool College, attended to receive the gold medal awarded to him in Political Geography, and Mr. JAMES D. WILDE, of Manchester Grammar School, also attended to

receive the bronze medal. The medals to the prizemen in Physical Geography were presented through Mr. A. R. Wallace, the Examiner.

The Royal Medals and the school prizes having been presented, the PRESIDENT proceeded to read his Annual Address on the leading geographical events of the past year. On its conclusion, Mr. CHARLES WHITE proposed, and Admiral INGLESFIELD seconded a vote of thanks to the President for his Address, with a request that he would allow it to be printed. The PRESIDENT then returned his thanks to the Meeting for their enthusiastic reception of this motion, and for the great attention they had shown throughout the reading of the Address.

At the appointed hour, the Scrutineers reported the result of the Ballot. The following were then declared duly elected as President and Council for the ensuing year: the names in italics being those of the new Councillors:—*President*: Sir Roderick Impey Murchison, Bart., K.C.B., F.R.S., &c. *Vice-Presidents*: Vice-Admiral Sir G. Back, D.C.L., F.R.S.; Francis Galton, Esq., M.A., F.R.S.; *Major-General Sir Henry C. Rawlinson*, K.C.B.; *Major-General Sir A. Scott Wagh*, F.R.S. *Trustees*: Lord Houghton; Sir Walter C. Trevelyan, Bart. *Secretaries*: Clements R. Markham, Esq., F.S.A.; R. H. Major, Esq., F.S.A. *Foreign Secretary*: Cyril C. Graham, Esq. *Councillors*: Right Hon. H. U. Addington; *Hon. George C. Brodrick*; Rear-Admiral R. Collinson, C.B.; James Fergusson, Esq., F.R.S.; A. G. Findlay, Esq.; Right Hon. Sir Thomas F. Fremantle, Bart.; Sir H. Bartle Frere, K.C.B., &c.; *Sir George Grey*, K.C.B.; *Lieut.-Colonel James A. Grant*, C.B., U.S.I.; *M. E. Grant-Duff*, Esq., M.P.; Captain E. A. Inglefield, R.N., F.R.S.; Captain Felix Jones (late L.N.); *Captain Sir F. Leopold McClintock*, R.N.; Captain Sherard Osborn, R.N., C.B.; Captain George H. Richards, R.N.; Major-Gen. C. P. Rigby, C.B.; *Arthur J. E. Russell*, M.P.; Thomas Thomson, Esq., M.D., F.R.S.; *His Grace the Duke of Wellington*; *Charles White*, Esq., J.P.; Sir Harry C. Verney, Bart., M.P. *Treasurer*: Reginald T. Cocks, Esq.

A vote of thanks having been proposed and seconded to the retiring members of Council, Committees, and Auditors, the Meeting separated.

PRESENTATION
OF THE
ROYAL AWARDS.

(At the Anniversary Meeting, May 24th, 1869.)

ROYAL MEDALS.

The PRESIDENT addressed the Meeting as follows :—

The Founder's Medal has this year been awarded to Professor Nordenskiöld, of Stockholm, for having performed a leading part in designing and carrying out the late Swedish expeditions to Spitzbergen, by which not only has our knowledge of the geography of that part of the world been much improved and illustrated by an excellent new map of those islands, but whereby great additions have been made to our acquaintance with the zoology, botany, geology, and meteorology of the Arctic Regions.

Anxious as the Royal Geographical Society has ever been and still is to promote Arctic researches, we naturally entertain the highest respect for the noble efforts which the Swedes have made of late to open out one of the main lines through the frozen seas, by which the North Pole may, it is hoped, be approached if not reached. Seeing that our Northern friends are still persevering in the same cause, from the carrying out of which richer and more powerful maritime nations have, alas ! shrunk, our Council has decreed that the person who headed the men of science in this Swedish expedition, and obtained such important results, should be rewarded with our Founder's Medal, and thus, by our marked approbation, be cheered on to further successes.

As an honorary Member of the Royal Academy of Sciences of Stockholm, and with a vivid recollection of the eminent men, from the days of Berzelius downwards, with whom I have been associated, I have peculiar gratification in handing this Medal to Baron Hochschild, the Swedish Minister, and in requesting his Excellency, the worthy representative of a Sovereign who is a distinguished geographer and one of our Royal Associates, to convey this Medal to his eminent countryman, Professor Nordenskiöld.

Then turning to Baron Hochschild, he continued :—

I beg your Excellency to understand, that whilst we have fixed upon Professor Nordenskiöld as the recipient of our highest honour, we fully recognise the great merits of the other Swedish men of science who were associated with him, and whose names are recorded in our volumes. From among those I may particularly mention M. Otto Torrell, who in 1858, at his own expense, led the way in organising and directing the first of these expeditions, which have shed so much lustre on his country, whilst it is also my pleasing duty to acknowledge how much the success of the last expedition was due to the skill of the Naval Commander, Lieutenant Fr. W. von Otter.

Baron de Hochschild thus replied :—

Mr. President, I regret exceedingly that circumstances should have prevented Professor Nordenskiöld from attending here to-day himself. Being a man of science, he is more worthy than I am to speak in this room; and he would most probably have given you some interesting details of his last important discoveries. However, his modesty, perhaps, would have proved an obstacle to expressing his gratitude, and would have prevented him telling you how very proud he is of the great honour you do him to-day. I am sure that he will consider it not only as a reward for his past labours, but as an encouragement to future deeds. You have, Mr. President, alluded to my Sovereign as a geographer. I am sure his Majesty will have much pleasure in hearing that his name was received with so much sympathy here. There were two words I noticed in what you said, Mr. President: you said, "our Northern friends." I hope they will always retain that name.

The President then spoke of the recipient of the Patron's or Victoria Medal:—

The Victoria Medal has been adjudicated to Mrs. Mary Somerville, who, throughout a very long life, has been eminently distinguished by her proficiency in those branches of science which form the basis of Physical Geography, and who having published a most able work on that science, was recently occupied, even in her 89th or 90th year, in solving abstruse mathematical problems. This gifted woman, who, in addition to her researches into the phenomena of the heavens and the earth, has also excelled in the arts of painting, music, and all feminine accomplishments, has, like the Crichton

of earlier days, truly earned the title of "the admirable Mrs. Somerville."

On one former occasion only has the Council devoted our Patron's Medal to a lady, namely, Lady Franklin: and as in that case the Queen was pleased to approve of our having honoured that lady for her services in ascertaining the fate and establishing the glory of her husband: so in the present instance I feel convinced that our gracious Sovereign will rejoice that her effigy should be borne by one of her own sex, who has attained such a high position amongst those who have largely advanced human knowledge.

On my own part, as your President, I can truly say that no act of my life could be more grateful to my feelings than to be the medium of conveying this Victoria Medal to the eminent authoress, who, throughout a period approaching to half a century, has honoured me with her friendship.

A D D R E S S

TO

THE ROYAL GEOGRAPHICAL SOCIETY.

Delivered at the Anniversary Meeting on the 24th May, 1869.

BY SIR RODERICK IMPEY MURCHISON, BART., F.R.S.,
PRESIDENT.

GENTLEMEN,

The Council having again kindly invited me to preside over you, I commence this Address with the expression of my hope that, if you should elect me, you will be pleased to make due allowance for the inevitable shortcomings of your old leader. Looking back to my Address of 1844, when I first occupied this chair, I know too well that I no longer possess that fund of knowledge which I had then recently acquired, by long journeys in Russia and the Ural Mountains and in many parts of Europe, and which imparted a freshness to my words that I cannot now command. But though my present energies of mind and body may be ill contrasted with those of the days when I could climb high mountains, and rouse you by a recital of the personal adventures of others as well as my own, I still maintain the same heartfelt devotion to your cause, whilst I am more grateful to you than ever for the kind indulgence with which you continue to receive my endeavours to serve you.

In that Address of a quarter of a century back, I already dwelt with pride on the high position which, after thirteen years of existence, this Society had taken up. It was then that I commenced that appeal to the public which induced the House of Commons, on the motion of Mr. Joseph Hume, to grant us the annual sum of five hundred pounds to keep up a National Map Office. This grant, which has ever since been continued, has enabled us to prosper, free of charge for house-rent. Our numbers, however, having augmented from 670 to 2300, our apartments, which we had taken on lease,

though adequate to contain our books and maps, have ceased long ago to be capable of holding one-third of the Members who attend our Evening Meetings. Hence we have been indebted for some years to the liberality of the Royal Society and the University of London for permission to assemble in their Great Hall, now, alas! demolished; and now, through the kind consideration of the Managers of the Royal Institution, we congregate in their excellent theatre.

When I consider the highly useful and popular character of our Body, and its intimate connection with the Foreign and Colonial Offices, and the Admiralty, I still entertain the hope that her Majesty's Government will, ere long, provide us with a mansion sufficient for our wants, the more so as six other scientific Societies are at this moment about to be provided, at the public expense, with Meeting Rooms and Apartments at Burlington House. But if this consummation should not be attained, we shall have time sufficient, before the lease of our premises in Whitehall Place expires in September, 1871, to provide ourselves with a Meeting Hall and Offices of our own. Meantime I may express my regret that, in the new scientific buildings now in the course of construction at Burlington House, no arrangements have been made for a large common Hall, containing accommodation for five hundred persons. It is only in the large building of the adjacent University of London, now rising to completion, that such a capacious Hall is in preparation; and, reverting to the former kind consideration of the Senate of that Body, I trust that we shall be permitted to hold our Evening Meetings in it whilst a large Hall of our own is being prepared.

In the mean time, advertent to our present state, I have to congratulate you on the further augmentation of our numbers, as well as upon the punctual issue of the last important and unusually large volume of the 'Journal.' When I look to the various duties, besides the editing of these volumes and the 'Proceedings,' which are performed by our indefatigable Assistant-Secretary, including the recent addition of much correspondence incident to our engagement to distribute Medals to the best geographical proficient of the Public Schools, you will all unite with me in offering our heartiest thanks and acknowledgements to Mr. H. W. Bates.

OBITUARY.

I naturally commence the record of our losses by a brief sketch of the truly eminent geographer and scholar, the late LORD STRANGEFOOT,

Percy Sydney-Smythe, the third son of the sixth Viscount Strangford, was born on the 26th November, 1825, at St. Petersburg, during his father's embassy in Russia; and, although after a few months he was sent over to England, the first language he spoke was Russian. He did not retain it after six or seven years old; but this early change of mother tongue, if it may be so termed, may have been some help to the extraordinary facility he displayed throughout his life in acquiring languages colloquially as well as by book.

His passion for languages developed itself at a very early age. Unable from partial blindness to join in playground sports, he occupied his out-of-school hours (at Harrow) in learning Persian from a grammar and dictionary of his own purchase, while his examiners will well remember what he achieved in Latin and Greek at the same time. During the one year he remained at Oxford, he taught himself Arabic, and was naturally chosen as one of the two "Student Attachés" nominated from Oxford and Cambridge, in 1845, for Constantinople—an idea having been formed of attaching young men to embassies in the East, for the study of Oriental languages. He became paid Attaché in 1849, and was afterwards made Oriental Secretary, an office he held till he retired from the service in the middle of 1858, having in the previous year succeeded his brother in the title. How he worked at Constantinople his companions there could tell best; but it was in these years that, while labouring assiduously in his official work which he never shirked, he acquired all the immense knowledge that astonished those who knew him well, but of which, alas! so little fruit has been left to the world. From the very first he made a thorough study of Sanskrit, and mastered all and every branch of the languages of the East, carrying them on to their more modern results in the West. He never studied and never took much interest in Chinese or in the Polynesian group of languages; but the study of all the rest became his chief employment. Profiting by the acquaintances he made in the non-Europeanized quarters of Stamboul, he soon spoke Persian and Greek with the facility of a native of the respective countries; could detect the differences of every dialect in pronunciation and idiom of the latter language; whilst the former became so completely his own, that to the very last, if he was suddenly startled, or when talking aloud to himself—a very constant habit of his—nine times out of ten he spoke in Persian.

But mere language was by no means the ultimate aim of his

labours; on the contrary, he made it his study both on account of its connection with the history of man, and because he believed it to be the one only absolutely trustworthy key to this history from the beginning: it was with this larger, wider, higher view, that it interested and absorbed him; and it is for this that his early death is to be deplored as an irreparable loss; for where numbers have studied and will study the details of each phase of these subjects, there are but few who, with the talent of amassing so much detail, have the power of grasping the wider and larger features into one great whole.

The great histories, now shrouded in the mists and veils of antiquity, of the pushing on of one horde after another from the centres of Asia over the plains of Eastern Europe, and the formation of nation after nation in the West, demanded another branch of knowledge,—namely, that of physical geography; and if Language was Lord Strangford's passion, Geography was his delight. In this study he stood pre-eminent. He knew nothing beyond the faintest outline of geology, but he comprehended in his geographical knowledge the understanding of all the features and *contours* of every country, besides the details of each. He never rested till he knew the height and direction of all the mountain-ranges, the extent and boundaries of the river-basins, with their valleys and plains; necessarily assisting this study by that of meteorology and climate. Thus his knowledge of geography became profound and full, while his curiously accurate memory enabled him to remember the names of towns and villages, which united them in his mind with the languages and manners of the inhabitants of each nation—the names confirming the geography, and the geography confirming the language.

Lord Strangford's health, naturally extremely delicate, was destroyed by overwork during the Crimean war; and he was disappointed at finding himself unequal to the fatigues of rough travelling, when, on succeeding to the title, he had leisure and means for so doing. For a few years he tried it, and made plans for far-away journeys; but it became too soon apparent that home was the best place for him, and he reluctantly gave up all hopes of leaving England, even for the commonplace travelling in Switzerland, which had been an immense pleasure to him. The meteorological changes in that country were a constant source of interest to him when there; and he had an intense enjoyment of scenery, although able only to see it with the aid of powerful opera-glasses. His aneroid was at all times his inseparable companion; indeed he was rarely

to be seen anywhere a couple of miles from home, even in London, without the aneroid in his pocket.

She who knew him best can truly speak of his fine temper—of his passionate love of truth and justice—of his indignation against all shams and false pretences—of his goodness and gentleness in private life—of his perfect and remarkable freedom from all malevolence and jealousy—or of his freehanded generosity in giving every man his due, and more than his due, for honest conscientious work—of his keen appreciation of humour and the fund of quiet goodnatured irony in himself, and of his warm and hearty fidelity as a friend. And this was combined with singular humility and modesty. No one ever heard Lord Strangford say one word which could be construed into a boast of himself, or a claim for his own acquirements; on the contrary, he was always ready and anxious to learn from others, with a frank avowal of his own ignorance. When in company with those who felt themselves his inferiors in knowledge, he hung back, rather than led; while to those who sought for information from him, he poured out all from his own stores with lavish kindness.

But this excessive mental activity was too much for Lord Strangford's feeble body. He was attacked at the end of July with a slight and partial paralysis, the effect of over-fatigue, but from this he appeared to have completely recovered, when, on the morning of the 9th of January, an effusion of blood took place on the brain, and he breathed his last in a few hours at the early age of 43 years.

What our Society has lost by this sad and unexpected event is deeply felt by us all; but I must add that my grief on the occasion has been greatly augmented by the deep sympathy I feel for his widow, the daughter of that beloved and sound geographer, the late Admiral Sir Francis Beaufort. The suffering of this most accomplished lady has been intense; but in her sorrow she has, at my urgent request, furnished me with many of the preceding lines; and our Fellows will greet them as the warm and truthful effusions of a deeply-attached wife, who has given us those just and delicate delineations of the character of our lamented associate, which no other pen could have so truly indited.

VON MARTIUS.—Germany has lost a truly great man in Charles Frederick P. VON MARTIUS, whom we were proud to claim as one of our Honorary Members. This renowned naturalist and traveller, who died in December, 1868, had so high a repute that many of his countrymen placed him on a level even with Humboldt. He was born at

Erlangen, in Bavaria, in 1794, and his father, the Court Apothecary of that place, having given him an excellent education, he soon took high academical honours, and in 1817 was sent to investigate the natural history of Brazil, by the Austrian and Bavarian Governments, in company with M. Spix. In carrying out their mission, the then almost unknown territory of Brazil was traversed in its entire length through the interior from south to north, and along the River Amazons from the Atlantic to the Peruvian frontier. Returning to Europe in 1820, the remainder of his long and laborious life was occupied in elaborating the results of this great journey, the narrative of which, chiefly written by himself after the death of his colleague, has become a classical book of travel, under the title of '*Spix und Martins' Reise nach Brasilien.*' The third volume of this great work, which relates to the Amazons portion of the journey, and is little known in this country, contains, besides the personal narrative of the voyage up the river, a *résumé*, it may be said, of all that was previously known of the Amazons region, showing the amount of conscientious labour, in the closet as well as in the field, employed by Von Martins in all he produced. It is additional testimony of no small value to the value of this work that Mr. Bates, now our Assistant-Secretary, who explored the Amazons for 1400 miles in the track of the great traveller, and has carefully studied the narrative of Von Martius, was astonished, as he has informed me, at the extent and accuracy of the information acquired by him during so rapid a journey. The numerous publications on botany which followed, so raised the estimate of his character that he was advanced to posts of high consideration in his own country. Of the botanical works he composed, the greatest, doubtless, was that on Palms ('*Genera et Species Palmarum.*' 1823), by which he raised the number of species from 15 as reckoned by Linnæus, and 99 by Humboldt, to the vast number of 582.

I should, however, entirely fail to do justice to Von Martius, if I spoke of him as a botanist only; for, in addition to much knowledge of other branches of science, he was truly eminent in our closely-allied sister science, Ethnology, of which, in the last years of his life, he gave a memorable proof in his sketch of the South American Indians, especially those of Brazil, accompanied by a collection of the vocabularies of these autochthones. In this work the author collected with great ability all those facts which enabled him to give a clear and, in some respects, quite a new idea of the origin and relations of these South American nations, tribes, and

families which have been for countless ages in a state of change. Of this work, Professor Huxley assures me that it contains by far the best and most exhaustive account of the physical character, the geographical distribution, and the social organization of the primitive inhabitants of the Brazils extant.

In a letter I received from this eminent man in October, 1866, when he sent me a copy of his well-composed and apposite *loges*, which, as Perpetual Secretary of the Academy of Munich, he pronounced on the deceased members, he thus alluded to his ethnological volumes on South America:—"When these shall be printed, all the time and power remaining to an old man shall be applied to the completion of my '*Flora Brasiliensis*,' in which labour I am proud to boast of the active co-operation of your eminent countrymen Bentham and Hooker."

Another of our countrymen, the late Robert Brown, justly renowned as the "*Princeps Botanicorum*," was one of the ardent admirers of Von Martius; and, in truth, he was a man of so thoroughly genial a disposition that all our leading botanists, including Sir W. Hooker, loved him as a man and revered him as a great authority.

M. DE LA ROQUETTE.—I will next say a few words in honour of an eminent French writer, the late M. de la Roquette, who was elected Honorary Corresponding Member of our Society in 1857. This excellent man was most distinguished by his devotion to the memory of distinguished geographers and travellers, which led him to compile their biographies with much research, accuracy, and warmth of appreciation. Thus we read in the *Bulletin* of the French Geographical Society, of which body he was one of the founders, the Lives of Hommaire de Hell, Dubois de Montperreux, Lieutenant Bellot, Sir John Franklin, Constant Prevost, Alexander von Humboldt, Daussey, and Jomard. When he was engaged in writing the Biographies of our famous countryman Sir John Franklin and of the illustrious Alexander von Humboldt, M. de la Roquette procured from me many letters of these great men which I possessed, and which threw fresh light on their characters. He was the author also of numerous articles in the *Biographie Universelle*, and of many papers on geographical subjects, published in the *Bulletin* of the Geographical Society of France, and in the *Annales des Voyages*, to which he was a contributor so long ago as 1824, in the time of the elder Malte-Brun, the editor of that important serial publication devoted to our Science. A member of the French Geographical

Society since its commencement, he was for several years the General Secretary of that Body, in which office his great activity and love of geographical pursuits enabled him to render great service. So much were his labours appreciated that he was elected Vice-President of that Society in 1847, and again in 1857 and 1858, and a few years before his death he received the title of Honorary President.

M. de la Roquette died in the eighty-fourth year of his age, and was buried in the presence of many distinguished men of science on the 12th of last August; the funeral oration being pronounced by that eminent leader of the French geographers, M. d'Avezac, of whom we are justly proud as one of our Foreign Associates, and who, I am happy to say, is still enjoying good health. In that graphic sketch M. d'Avezac indicates the various phases of the career of M. de la Roquette before the year 1821, when he seriously attached himself to geography. In it we are also reminded of the various translations of foreign works which he carried out and annotated, such as those of the English Expedition up the Orinoco and Apuré rivers by Hippiusley, Wilkinson's Description of Moldavia and Wallachia, and the Voyages of Columbus, which he translated from the Spanish in conjunction with our Foreign Associate, my old companion, Edouard de Verneuil. His last work was the publication of many of the most remarkable letters of Alexander von Humboldt, which he collected with great assiduity. Of these, one volume only has appeared, but the other is far advanced. Activity and conscientious accuracy, as M. d'Avezac has well said, were the dominant features of the character of de la Roquette, and these, combined with the kindest manners, rendered him a great favourite among numerous friends and acquaintances.

SIR JAMES BROOKE, Bart., K.C.B.—No one of our deceased Fellows deserves a more lasting place in our annals than the late Sir James Brooke, so widely known as the Rajah of Sarawak, who died at his seat in the south of Devonshire, on the 11th June, 1868. The son of a civil servant of the East India Company, he was born at Bandel, in Bengal, in 1803. Shortly after, entering military service, he was severely wounded in the Burmese war, at Ringpoor, and returned to England. Subsequently he visited China, and it was on his return from that country that he undertook, at his own cost, in 1838, that expedition to Borneo, which by the energy and devotion with which he carried it out, and from the important results with which it terminated, has justly won for him

a foremost place among the most enterprising of British explorers who have followed in the track of Raleigh.

The fitting out of his own yacht, the *Royalist*, with the bold and avowed object of suppressing piracy in the Eastern Archipelago, and the progress he made in visiting different places in these seas, is graphically given in his own Diaries, most fortunately preserved for the public through the friendship of that gallant and accomplished officer, Captain, now Admiral, Sir Rodney Mundy. In them we learn what great difficulties he had to overcome in extirpating piracy among the Dyaks* of Borneo, and the feats which were accomplished by the crews and boats of the *Iris* and *Phlegathon*, in all of which adventures Brooke took a leading part with his friend, Captain Mundy, as depicted in this work with illustrations. Afterwards, in the Expedition to Borneo of H.M.S. *Dido*, under Captain, now Admiral, Sir H. Keppel, which took place in 1846, we further learn with what eagerness he strove to suppress piracy, and to bring the native Dyaks to a sense of order, and how he established his own Government of Sarawak, of which he had been declared the Rajah in 1841, at the desire of Muda Hassim, his predecessor in that dignity. His official proclamation as Governor of Sarawak dates from the 21st of September, 1841, on which day the British flag was there hoisted. Men of his generation can remember with what delight the Rajah was received in England in 1847, when he returned after all these exploits. Even the Queen congratulated him, conferring on him the knighthood of the Bath, and the Lord Mayor and Common Council voted him the freedom of the City of London; he received the diploma of D.C.L. from the University of Oxford, amid many plaudits, and, not least, we honoured him with one of our Gold Medals. He was created also, by the Queen, Commissioner and Consul to the Native States of Borneo, and Governor of Labuan, which latter island, valuable as promising coal, was purchased from the Sultan of Borneo by the British Government.

But, alas! this noble example of a chivalrous English gentleman was destined to undergo much severe criticism, and to have and to have to stand against charges publicly brought against him (as I think, in a mistaken view of the subject) by that honest and straightforward, but occasionally uncompromising economist, Joseph Hume; whose endeavours, however, to procure from the House of

* "Journal of James Brooke," by Captain Rodney Mundy, R.N., p. 183.

Commons what would have been equivalent to a censure on his conduct were more than once defeated.

On the other hand, our deceased Fellow had numerous warm supporters, including the naval officers Admirals Sir Thomas Cochrane, Sir James Gordon, Sir H. Keppel, and Sir Rodney Mundy, with whom he had been associated; and one of his most zealous defenders was our former President, that enlightened nobleman, Francis Egerton, the first Earl of Ellesmere.

This period of trouble being passed, *not*, however, without great mental suffering and injury to his bodily health, Sir James Brooke was taken out in 1853 to his Government of Sarawak by his distinguished friend Admiral Hall. He and Keppel had the gratification of seeing order thoroughly established, a good Christian Mission organized which ended in the establishment of a bishopric, the duties of which were zealously performed by the Right Rev. F. M. MacDougall, Bishop of Labuan. During the last years of his residence in Sarawak (1857) Sir J. Brooke very narrowly escaped being killed, through a sudden attack of an infuriated body of Chinese who had been irritated to madness by the suppression of the trade in opium; and on this occasion, as in every event of his life, he showed the most perfect coolness and resolution.

Viewing the career of Sir James Brooke as Rajah of Sarawak, we have a right to be proud of him, as a singularly gallant and successful explorer and an enlightened administrator; whilst every one who knew the man became attached to him, from those manly and open manners by which, doubtless, he exercised a great influence over the uncivilised people among whom he had cast his lot. Among his numerous warm friends no one had a sincerer regard for him than that patroness of all good works, Miss Burdett Coutts.

The late lamented Rajah Brooke was buried in the secluded village of Shapton, Devonshire, near his residence of Bunator, at which he died. He bequeathed his property and rights to two nephews successively, and, failing any children of the present Rajah and his brother, he willed the reversion of them to the Queen. By this document he authorized his kind and attached friend, Miss Burdett Coutts, to carry out his wishes in a joint-trust with Mr. J. A. Smith and Mr. Thomas Fairbairn. By this act he also gave a clear proof of his loyal feeling towards the poor people whom he had raised from an abused condition to a state of comfort; by it he further evinced his resolution to prevent future misgovernment,

and thus to entail, as it were, the official register that Sarawak must, from its important maritime position and useful productions, be ever held as a British dependency.

SIR C. WENTWORTH DILKE.—The sudden death of Sir C. Wentworth Dilke, Bart., at St. Petersburg, on the 10th May, has deprived the public at large of a very useful and respected member, and our Society of one of its old associates. Sir Charles Wentworth Dilke, Bart., had repaired to St. Petersburg, with his younger son, Mr. Ashton W. Dilke, to act as the representative of British Horticulture at the Congress of Botanists and Florists, now assembled at the Imperial city, and I had myself given him letters of introduction to my friends within it.

Educated at Westminster School and Trinity College, Cambridge, he soon left the bar, for which he was designed, and entered with vivacity into literary work, chiefly as connected with the 'Athenæum' weekly journal, of which his father was long the proprietor and editor. He took a very active part in establishing the Royal Horticultural Society, and thereby attracted the marked notice of his Royal Highness the Prince Consort. He was also one of those who resuscitated and imparted fresh energy to the Society of Arts, which has since risen so highly in public estimation. The success of the Great International Exhibition was in a considerable degree indebted to him, as will be acknowledged by Mr. Henry Cole, C.B., who then commenced that series of efforts to encourage the Establishments at South Kensington for the promotion of Science and Arts, which prospered so strikingly under the ægis of the late lamented Prince Consort.

The brilliant success of the Exhibition of 1851, in which Wentworth Dilke acted as one of the most energetic of the Executive Committee, led her Majesty's Government to name him one of the five Royal Commissioners for conducting the second Great Exhibition of 1862; and it was after the demise of the Prince Consort, whose views he so effectively supported, that the Queen conferred the title of Baronet upon him.

Sir Charles Wentworth Dilke entered the House of Commons as Member for Wallingford, which he represented until the last dissolution. He is succeeded in the title by his eldest son, one of the new members for Chelsea; who has already, at his early age, attained well-merited distinction by his remarkable work entitled 'Greater Britain,' in which he has not only much excited the reading

public, but has shown that he possesses the true spirit of a British explorer, the capacity of an able statist, and the felicity of a ready writer.

In reference to our deceased member, Sir C. Wentworth Dilke, I ought further to state that he served gratuitously as the English Commissioner at the Great American National Exhibition at New York in 1853.

Mr. J. H. BROOKING, who died on the 13th January, 1869, a highly respected merchant in the city of London, was one of the best supporters of our Society, to which he attracted many influential mercantile gentlemen, who, like himself, felt that geographical explorations in distant lands frequently lead to most important commercial results. By his death we have lost a very effective member of our Council, and a clear-headed man of business, who watched zealously over our finances, and who had most certainly at heart the permanent interests of our Body.

Sir JOHN P. BOILEAU, Bart., who died on the 9th of last March, was much esteemed by a large circle of friends for his engaging social qualities, and his extensive accomplishments. He was a Vice-President of the Society of Antiquaries.

Mr. JOHN DICKINSON, F.R.S., for many years a Fellow of this Society, had at the time of his decease, on the 11th of January last, nearly attained the advanced age of 87. Actively engaged in business pursuits during by far the greater part of his long life, he still took a keen interest in various branches of science, and more especially those of astronomy and geography, having constructed an observatory at his country house of Abbots Hill, in Hertfordshire, and having in his later years devoted the greater part of his leisure hours to the study of narratives of recent geographical discoveries. As a mechanical inventor he was well known, particularly in connection with the manufacture of paper, which he materially assisted in bringing to its present state of perfection. Besides various pamphlets connected with the water supply of London, and other questions of the day, he communicated to the Royal Society some observations on the supply of water from the chalk stratum in the neighbourhood of London, containing much valuable information, and including records, extending over many years, of the amount of percolation through a Dalton gauge, which have since been frequently quoted.

I have only to add that Mr. John Dickinson was very highly

respected by numerous cultivators of science, letters, and the fine arts, and that in common with many of my friends I fully appreciated his fine social qualities.

Sir EDWARD CUXARD, Bart., was distinguished by the talent and activity he displayed in keeping up in perfect efficiency the famous line of rapid packets between America and England established by his father, the first Baronet, and has left behind him a really good and respected name.

Rev. S. W. KING, Rector of Saxlingham, Norfolk, was a man of high scientific attainments, known to the general public as the author of the '*Italian Valleys of the Alps*.' He was not only a geographer, taking a lively interest in the operations of our Society, but a cultivator of various other allied branches of science, including geology, entomology, and archaeology, having imbibed these tastes from his father the Rev. W. H. King, an accomplished scholar who resided at the vicarage of Nuneaton, Warwickshire, where our late associate received the rudiments of that solid education which rendered his later life so distinguished. As an antiquary he published several interesting papers, and his geological researches in Norfolk are well known to the cultivators of that noble science, some of his discoveries having been made public in Sir Charles Lyell's '*Antiquity of Man*.'

Mr. King has been called away in the prime of life; had he been spared, there is no doubt he would have made for himself a name and a place in the highest ranks of science. He died on the 8th of July, 1868.

Dr. H. NORTON SHAW.—Although never enrolled on our lists as a Fellow of the Society, and therefore not strictly coming within the scope of the Obituary, to which the occupiers of this Chair are confined, I feel it to be my duty to say a few words respecting one who was for fourteen years the active Assistant-Secretary of our Body, and whose zeal and ability were exerted in promoting the welfare of the Society by procuring numerous additions to its members.

Born in one of the Danish West India Islands, the son of a General in the Danish service, young Norton Shaw received part of his education in New York. He afterwards became an Assistant-Surgeon in the Navy, and, having retired from that vocation, he was chosen in 1848 our Assistant-Secretary. At that time, the number of our Fellows was not more than a third of what it subsequently became, and Dr. Shaw had the merit of supporting the then President, Captain (afterwards Admiral) Smyth, with so much vigour, that

now life was infused into our proceedings; and the Roll of our Fellows first assumed that progressive enlargement which has not abated down to the present time.

Among the many cases in which he personally exerted himself to promote the interests of the Society and the cause of Geography, I shall ever remember the zeal with which he successfully advocated the appeal that I made to erect a Memorial to the brave young French officer Bellot, who lost his life in the search after Franklin, and which monument stands on the Quay near Greenwich Hospital. Let me also place it on record that it was Dr. Norton Shaw who took the most active part in the organisation of that great festival which was offered to Livingstone after his first great exploration in Southern Africa, and at which I presided to do honour to the illustrious traveller. In short, it was on occasions when honour had to be shown to the good deeds of geographical explorers, that the services of our late energetic officer were most conspicuous.

Though he never published original works, his name is connected as editor with various good and useful publications, and the 'Royal Illustrated Atlas,' which he conducted, was very creditable to him; whilst his services as Editor of the annual volumes of our Journal, during so many years, give him a just claim on our gratitude.

Some time after leaving our service, at the end of the Session of 1863, he was appointed by Lord Stanley, then Secretary for Foreign Affairs, British Consul at the island of Ste. Croix, at which place, being a Danish possession, he was well qualified to act, from his knowledge of the language. He died in that colony in the summer of last year.

His eldest son is an accomplished young lawyer at Copenhagen.

Sir JOHN V. P. JOHNSTON, Bart., many years the respected Member of Parliament for Scarborough, who recently died from the effects of a fall in the hunting field, was one of my oldest and most valued friends. He was a judicious patron both of science and the fine arts, inasmuch as by his aid William Smith, the father of English geology, was, during some of his aged years, comfortably supported; whilst the now celebrated sculptor, Noble, when in his youth, was kindly fostered and encouraged by him. The first of these, when acting as Sir John's land agent, constructed a geological map of his beautiful estate of Hackness, near Scarborough, which remains as a model to convince all country gentle-

men that the farmer must always be indebted to the geologist; and my friend Mr. Noble has more than once spoken to me in the warmest terms of gratitude towards his earliest patron. A member of the British Association for the Advancement of Science from its foundation at York in 1831, where, as the son-in-law of the venerable Archbishop Vernon Harcourt, and the brother-in-law of its eminent founder, the Rev. William Vernon Harcourt, he was of real service to us. He was subsequently one of the active originators of the Royal Agricultural Society of England, in the management of which he played a conspicuous and useful part. Few men of this age were more beloved than Sir John Johnstone, who was ever recognised as a warm-hearted, liberal, and enlightened country gentleman by very many devoted friends, and by the men of all classes in the county of York, who deplored his death.

Besides those Fellows who have made some mark in Geography or the associated sciences, the Society has lost the following Associates:—

Lords ASHBURTON and CALTHORPE, the first an elegant scholar, and the brother of our former President; the other a man of high character, and justly esteemed for his great philanthropy and truly religious conduct.

Sir WILLIAM CLAY, Bart., many years a Member of Parliament, and once holding the office of Secretary to the Board of Control; he was also the author of good works on Finance.

From among the other deceased Fellows I single out the name of my old and valued friend, Mr. EDWARD MAJORIBANES, the widely known and universally respected senior partner in the house of Messrs. Coutts and Co., who died in his 90th year, after a wise and well-spent life.

The remaining list of deceased Fellows is as follows:—Mr. John Arthur, Mr. Charles Bell, Mr. Charles Coote, Captain Roderick Dew, R.N., C.B., an enterprising naval officer; Commander C. R. Egerton, R.N., Mr. William Ewart, during many years a useful and laborious Member of Parliament; Mr. Anthony L. Fisher, Mr. Richard Fort, Mr. John Griffith Frith, Mr. George H. Fitz-Roy, Mr. A. Gibson, Sir William H. Holmes, of Demerara, who held public offices in British Guiana; Major G. A. James, Mr. J. M. Laurie, Mr. H. L. Long, Mr. George W. Lenox, Mr. George Macfarlan, Mr. Colin W. Macrae, Dr. Samuel Osborn, Mr. T. V. Robins,

Mr. G. M. Robinson, Mr. John Smith, Mr. James Simpson, Mr. Charles John Tindal, Mr. Nash V. E. Vaughan, and Mr. Robert Walker.

ADMIRALTY SURVEYS.*

The hydrographical surveys under the Admiralty have progressed very satisfactorily during the past year, both at home and abroad; and, in addition to the ordinary results of these surveys, great advances have, through them, been made in our knowledge of the character of the sea-bottom at its greatest depths, which both in the interests of submarine telegraphy, and as throwing a light on subjects connected with physical science, hitherto not altogether clear, have been received with general satisfaction. It is further hoped that a cultivation of such investigations may be attended with still further discoveries of practical utility as well as of scientific interest.

The researches of Dr. Carpenter and Professor Wyville Thomson on the subject of sea-bottoms and temperatures at considerable depths between the Hebrides and the Faroe Isles, which were carried out in H.M.S. *Lightning*, placed at their disposal by the Admiralty for a portion of last summer, have proved of such special interest as to lead to a further investigation of a more extended character to be undertaken during the present year.

The interesting results of the former expedition have been described by Dr. Carpenter in a preliminary Paper, and published in the Royal Society's 'Proceedings,' vol. xvii., No. 107.

Home Coasts.—The examination and rectification of the Surveys of the Coasts of the United Kingdom are, with one special exception, confined for the present to the force under Staff-Commander E. K. Calver, in H.M.S. *Porcupine*, which, during the past year, has been principally employed in making a very minute and critical survey of the River Medway, on a scale of 20 inches to the mile, between the Dockyard at Chatham and Okehamness, with the view of affording reliable data in connexion with the deepening of that river, and the great Government works in progress there.

Staff-Commander Calver has also surveyed the South Bay of Wexford, for the purpose of testing its capability as a site for a harbour proposed in that narrow portion of the Irish Sea, which, owing to the dangerous and impracticable character of the entrance

* By Capt. G. H. Richards, R.N., F.R.S., Hydrographer to the Admiralty.

to Wexford itself, is much to be desired for commercial purposes; a re-survey has likewise been made of several of the off-lying shoals on the Suffolk coast, and of a portion of the entrance of Harwich.

Portsmouth Harbour and Spithead.—This special survey is being carried on by a small party under Staff-Commander D. Hall, by means of boats; it comprises a very elaborate examination of the whole harbour on a scale of 30 inches to the mile, which had become necessary, both on account of the extension of the dock works, as well as with a view to removing some of the many banks which obstruct the waters of this our principal naval arsenal, the entrance to which has been so greatly improved by dredging during the past few years; good progress has been made with this survey, as well as a re-examination of Spithead, in connexion with its re-buoyage, and the publication of a larger plan of its anchorage than hitherto existed.

Channel Islands.—This survey is being conducted by Staff-Commander J. Richards and one assistant, with the means afforded by the vessels employed in protecting the fisheries, and by the aid of boats; during the summer of 1868 the northern portion of the Minquiers Reef, and other dangers between Jersey and the coast of France, have been surveyed. The channels northward and southward of Jersey, as far westward as the meridian of the Roches Douvres have also been sounded, and several new dangers discovered and placed on the charts.

It is hoped that the survey of these islands, the dangerous and intricate character of which has called for the most able and vigilant research on the part of the officer conducting it during several years, will be brought to a close at the end of this season, and that the results will leave nothing to be desired on the part of the navigator.

Mediterranean.—It was stated in the last yearly Report that the *Hydra*, in which vessel this survey was being conducted by Captain Shortland, had been called away to obtain deep soundings for the submarine cable between Aden and Bombay. After successfully completing this service, an account of which has been written by Captain Shortland and published by the Admiralty, the ship returned to England, bringing a consecutive line of deep-sea soundings from the Cape of Good Hope by St. Helena to the English Channel. The greatest depth obtained on this line was about 200 miles southward of St. Helena, at 2800 fathoms, and this is believed to be the

deepest reliable sounding on record, a considerable quantity of the bottom having been obtained and preserved.

The *Hydra* was replaced in the Mediterranean by the *Newport*, a small screw-steamer under Commander G. S. Nares, whose first duty was to survey the line for the submarine cable between Malta and Alexandria, and then to escort the cable-ship while submerging the cable; both of which duties were successfully performed. The greatest depth on this line was found to be 1840 fathoms.

The *Newport* has since completed the survey of the western portion of Sicily, preparatory to extending the soundings across the volcanic region of the Adventure Bank to Tunis, and satisfactorily determining the position of the various banks which lie between Sicily and the African shore. The roadstead of Melazzo, at the entrance of Messina Strait, and the harbour of Syracuse, have also been surveyed.

Strait of Magellan.—The *Nassau*, Captain R. C. Mayne, C.B., has completed the eastern portion of this strait from Cape Virgin to the Chilian Settlement, Punta Arena, which has been published by the Admiralty in two sheets, on a good navigating scale.

The inner channels between Port Tamar and the Gulf of Peñas have also been generally examined. Several new anchorages have been discovered and surveyed, which will be of great advantage as stopping-places for steam-vessels bound into the Pacific by these inner waters. All the intricate portions of the channels, such as the English Narrows, Victory Pass, and the channel between Long and Summer Islands, have been examined and charted on good scales.

In the latter passage not more than 33 feet at low water can be commanded over the ridge which joins the two islands, and the width here is not over three cables' length, or 600 yards; sufficient, however, in the smooth water of these regions, for the heaviest ships at present in existence.

In the western portion of the Strait itself a general examination has been made of both shores from Cape Pillar to Port Famine, resulting in the discovery of some safe anchorage for the largest ships—a want hitherto much felt, and resulting but lately in the total loss of a fine steamer, the *Santiago*, belonging to the Pacific Steam Navigation Company, which struck on a rock off that inconvenient and unsafe port "Mercy Bay," hitherto the only known anchorage available at the western entrance.

During the season when the severity of the climate prevented the *Nassau* from working in these tempestuous regions, she was usefully employed on the western coast of America, and surveyed the bays of

Coquimbo and Herradura—a want much called for by the increasing trade of these ports. On returning south from Chiloe, the *Nassau* passed inside that almost unknown group of isles in the Chonos Archipelago, and again into the Pacific by the Darwin Passage, the navigation of which was found available for vessels of any size.

The *Nassau* is about to return to England after a somewhat short but very arduous service of three years, during which her officers have added much to our knowledge of that most convenient route for steamers between the Atlantic and Pacific Oceans, and left, indeed, nothing to be required by the navigator but that care and vigilance which, under even the most favourable circumstances, is imperatively necessary in such a region of storms.

North China and Japan.—This region is considered to include all the coasts of China and Japan north of the parallel of Hong Kong, and its examination is being carried on by the officers of the *Sylvia*, under Commander E. W. Brooker.

As, however, we possess very fair surveys of the coast of China itself, between Hong Kong and the entrance of the Yang-tze River, the object has been to confine, as far as possible, the labours of the *Sylvia* to making such an impression on some portion of the coast of Japan as would probably lead to a systematic and consecutive survey of its extensive shores. Owing, however, to the increasing commerce and consequently increasing demands of navigation at points widely distant from each other, to the actual physical changes that are taking place at the entrances of the great rivers of China, and to the frequent calls that are made on the surveying officers to search for some reported danger, often imaginary, or to report on some special subject to some special authority, it has been found difficult with a single vessel to follow out this object, and the consequence has been hitherto that we have been what may be called tinkering at Japan, and the valuable work which the surveyors have obtained has, from its fragmentary character, not been as available for present use as it would have been under a different system. During the past year, however, very considerable progress has been made in the direction pointed out, and a good survey has been made of the coast of Kiu-sui (the southern island) between the port of Nagasaki, through Spex Strait, as far as the entrance of the Strait of Simónoseki. The actual distance between these points is but 120 miles; but the broken character and deep indentations of the shore extend the actual survey to over 500 miles. In November, 1868, the *Sylvia* was called away from Japan and crossed over to the

Great Yang-tze Bank to search for a shoal reported on its outer edge, 120 miles from the Light Vessel at the entrance of the river. The danger, however, was not discovered, nor did the examination in any way indicate the probability of its existence.

On her way to the south, a re-survey of the channel and banks at the entrance of the River Min was executed, where great changes were found to have taken place since former surveys of 1843-54; and a system of buoyage was proposed to the Chinese authorities which, if adopted, will greatly facilitate the navigation of the river, on the banks of which, about 35 miles within the entrance, stands the important city of Foo Chow.

The *Sylvia* has returned to resume her surveying duties in Japan, and will proceed with the examination of such parts of the coast as will be of most interest to commerce and navigation. Hitherto this country has borne almost exclusively the burden of opening up the boundless resources of the extensive and flourishing empire of Japan by its explorations and surveys; and the many casualties which have occurred, and may be expected to occur, not only among the mercantile marine but to our ships of war, for the want of correct charts, would appear fully to justify the employment of one small vessel on such useful work. At the same time, looking to the enlightened progress of the Japanese themselves, and the aptness they have shewn for acquiring the knowledge and modern appliances possessed by the civilised nations of other countries, it is reasonable to hope that the time is not distant when we may expect them to co-operate, or to take a leading part, in a work so necessary as the correct delineation of their own shores, and of the dangers and obstructions which at present render the approach to them, in many cases, attended with difficulty and risk.

The China Sea Survey.—Under this name is included that extensive region lying between the parallel of about 4° s. and that of Hong-Kong in about 22° n.; bounded on its west by the eastern shores of Sumatra, the Malay Peninsula, and China; on its east by Borneo and Palawan; and comprising within it those numerous islands which form the various channels into the China Sea south of Singapore; and the innumerable coral-reefs which encumber the China Sea proper, and divide it into the two great highways through which the commerce of the West passes to Hong-Kong and the north.

The making of these paths clear, and the opening up of the ports of China to the vast commerce which now pours into them from all

parts of the world, has been the patient but persevering work of the navy of this country for thirty years.

Commenced in war and continued in peace, well may it have been considered a gigantic task to which no end could be seen when first undertaken; and yet the end, so far as this great area is concerned, may now be clearly and definitely counted upon. And when it is remembered that never more than two, and frequently not more than one, of the smallest class of vessels in the navy have been consecutively employed on this great work; and when the results are considered, the price which it has cost in money will scarcely be considered an excessive one: nor will the labour, and energy, and ability which has been devoted to it be deemed to have been ill-bestowed.

The survey is at present being conducted in H.M.S. *Rifleman*, under Staff-Commander J. W. Reed. During the past year the examination of the reefs which form the eastern edge of the main passage from Singapore to Hong-Kong have been completed, as also some others in the Palawan Passage; and both these routes may now be considered as sufficiently known to ensure the safety of navigation with ordinary caution.

The survey of Balabac Strait, between Borneo and Palawan, together with the Island of Balabac* and Balambangan, is also well advanced; and here the *Rifleman* is now employed. When this work is completed, the route eastward of Palawan to the Philippines and the coast of China during the adverse monsoon will be made safe; although the Sulu and Celebes Sea, with Macassar Strait, will still remain a nest of dangers for future exploration.

During a visit to the Gulf of Siam the position of some doubtful dangers were searched for and found not to exist, and have consequently been expunged from the charts.

The *Rifleman* has also made very considerable additions to the survey of Singapore Strait, by which the chart of that neighbourhood has been much improved and 30 miles of the Malay Peninsula northward of Singapore has been re-surveyed and sounded.

Staff-Commander Reed and his officers availed themselves of the opportunity of observing the total eclipse of the sun, which occurred on the 18th August, 1868, and for this purpose visited Baram Point, on the west coast of Borneo. He was accompanied by Mr. Pope

* One of H.M. ships has been totally lost on the dangerous reefs to the westward of this island since the survey commenced last year, and the *Rifleman* herself grounded during the prosecution of the work and narrowly escaped shipwreck.

Hennessey, the Governor of Labuan, who went for the purpose of making similar observations, and which were very successfully obtained. The *Bislem*'s observations were communicated to the Royal Society.

Before quitting the China Seas, it will not be out of place to mention that extensive surveys of the Philippine Isles and seas adjacent are in course of progress by a Hydrographic Commission, under the conduct of Captain Claudio Montero, of the Spanish Navy, through whose co-operation with Staff-Commander Reed, and courtesy in sending to this Department copies of his surveys immediately they were made, very valuable additions and corrections have been made in the Admiralty Charts of these regions.

West Indies.—Staff-Commander Parsons, with his two assistants, have been principally employed during the past season in making an accurate detailed survey of the island of Barbadoes, which will be completed during the present year. Hitherto no survey worthy of the name had existed of this small but flourishing and valuable island, and more than one serious accident and shipwreck had of late occurred from want of correct charts.

The surveyors in the West Indies have been several times diverted from their ordinary duties during the last season to examine whether any material changes had been caused by the earthquake-wave of 1867, which does not appear to have been the case; and surveys of Virgin Gorda and its approaches have been made in reference to its capabilities as a packet-station.

NEWFOUNDLAND.—Staff-Commander J. H. Kerr and his two assistants have surveyed 200 miles of coast-line and sounded over 700 square miles in the vicinity of Cape Freels and Togo Island, on the east coast. The dangerous character of the shoals, which extend far off this coast, render it very necessary that they should be well defined on the charts, especially since—in consequence of the decline of the fisheries on the Newfoundland coast—the traffic to the Labrador grounds is so much increased; and to which this route is the high road, both for the fishery vessels and the ships of war which are employed in their protection.

Staff-Commander Kerr has likewise completed the survey of Conception Bay, and determined several astronomical positions round the entire coast, with a view to the construction of a new series of charts to supersede those of the last century.

BRITISH COLUMBIA.—The surveying party in this colony, under Staff-Commander Pender in a hired vessel, have been employed in

examining and making clear the channels between the northern end of Vancouver Island and the British boundary in $54^{\circ} 40' N.$; 900 miles of coast have been so examined, 150 miles of which have been exposed coast, at all times difficult and hazardous to effect a landing upon. Portland Inlet, through the centre of which runs the boundary between the British and lately-acquired territory of the United States, has been surveyed and found to extend 11 miles further north than shown on the old charts. Several new anchorages have also been found and surveyed on the main route between Vancouver Island and Fort Simpson, the northern boundary.

CAPE OF GOOD HOPE.—Navigating-Lieutenant Archdeacon and his assistants have, during the past year, completed the survey of the eastern coast of the colony to the Bashee River, about 150 miles short of Natal; when, in consequence of negotiations pending between the Colonial Government and the native tribes east of the Bashee, it was considered desirable not to pursue the work further at present, and the party were consequently removed to the western coast of the colony, which they have surveyed as far north as Saldanha Bay, and found many errors in the old charts. They are now continuing the work northerly, and a survey of Saldanha Bay together with a re-survey of False Bay are in progress.

AUSTRALIA.—*New South Wales.*—The re-survey of the seaboard of this colony from Cape Howe in the south to Danger Point in the north, embracing a distance of about 600 miles of latitude, has now been completed; and its numerous ports and anchorages surveyed with all the accuracy necessary for ocean navigation, or indeed for any purposes. At the present time the officers are obtaining the off-shore soundings and other data necessary to render the charts complete, and at the close of the present year the Admiralty Survey of New South Wales will be complete, and the officers withdrawn. The survey was commenced by Captain Sidney in the year 1861, and is now under the conduct of Navigating-Lieutenant J. T. Gowland, Captain Sidney having retired in 1868, after a long and meritorious service of 34 years, during which he was constantly engaged in surveying duties in various parts of the globe.

Victoria.—Navigating-Lieutenant Henry J. Stanley with two assistants have, during the past season, been employed in surveying the coast of this colony between Cape Schanck and Wilson's Promontory, and plans of the bays and anchorages within these limits have been made on scales suitable for navigation. A re-survey of the entrance to Port Phillip has also been completed.

The southern shores of Australia are much exposed, and generally difficult to land upon in consequence of the heavy surf almost continually rolling on the beach. More extended means are, therefore, required to carry on the work, nor can it be expected to proceed with the same rapidity and uniformity which has been found practicable on the more sheltered coasts of New South Wales and Queensland.

South Australia.—During the year 1868 the eastern shore of St. Vincent Gulf has been examined from Adelaide to Cape Jervis, thus completing the survey of the whole of this extensive gulf. The outer coast eastward, from Cape Jervis to 30 miles beyond the Murray River, has likewise been surveyed.

Captain Hutchison having been promoted, the charge of the survey is now in the hands of Navigating-Lieutenant F. Howard, who is continuing it with one assistant.

Queensland.—Navigating-Lieutenant E. P. Bedwell and an assistant have surveyed the coast of Queensland from Moreton Bay to Indian Head, or nearly to Sandy Cape, a distance of 130 miles, and have carried the soundings to a distance of 15 miles from the shore. This is a very important addition to our knowledge of a part of the coast hitherto entirely unsurveyed. Wide Bay and the bar to the entrance of Great Sandy Strait, with the southern portion of the strait itself, have also been sounded.

H.M.S. *Virago*, which is principally employed on the coast of Queensland in the channels inside the Great Barrier between Sandy Cape and Cape York, has a surveying officer—Lieutenant Armit—attached to her, who loses no opportunity which circumstances afford him, of adding to the charts of this region, some portions of which are still very imperfectly known.

Auxiliary Surveys.—Commander Chimmo and the officers of H.M.S. *Gannet* were employed during the early part of 1868 in completing the survey of Trinidad and the approach to the Gulf of Paria; and subsequently in defining the deep limits of the banks south of Newfoundland, and searching for some off-lying shoals which were supposed to exist; likewise in investigating the phenomena of the Gulf Stream; and, finally, in carrying a line of deep-sea soundings across the Atlantic; in all of which researches they added considerably to our knowledge, and Commander Chimmo's investigations formed the subject of a paper which was read before the Royal Geographical Society.

H.M.S. Serpent.—Commander Bullock having been directed in

1868 to proceed from Japan to the Java Sea, for the purpose of obtaining deep-sea soundings to facilitate the laying of a submarine cable between Australia and Java, he accordingly left Japan in May, 1868, and, proceeding eastward of the Philippine Isles, touched at Mantawaln Kiki in the Gulf of Tonini, Celebes Island, where the total eclipse of the 18th August, 1868, was observed by the officers of the *Serpent*, and also by professional astronomers from Manila, whom Commander Bullock had brought from thence for the occasion, the results being communicated to the Royal Astronomical Society. From here the *Serpent* proceeded to Amboyna, and thence to Koepang in Timor, in the neighbourhood of which some slight surveying operations were performed; and a line of deep soundings were then carried south of the Isles of Flores and Sumbawa, through Bali Strait to Pampang Bay, on its western shore, a detailed plan of which was made as a terminus for the shore-end of the cable. The result of this survey proved that a moderate depth of water—not more than 1800 fathoms—existed along the proposed line, and that it was a suitable route for a cable.

After refitting at Singapore, the *Serpent*, taking her departure from Penang, carried a deep line of soundings across the Bay of Bengal to Point de Galle, at the south end of Ceylon, the greatest depth found being 2200 fathoms.

Summary.—During the year 1868, Sailing Directions have been prepared and published for the West Coast of Africa from the River Cameroon to the Cape of Good Hope; and for the Bristol Channel, between Hartland Point and St. Ann's Head.

The 'North Sea Pilot,' Part IV., has also been revised, and various Hydrographical Notices, containing the latest information of the coasts of China, Japan, the Straits of Magellan, &c., have been brought out.

The usual Tide Tables and Lists of Lights have been published, and 146,500 copies of Admiralty Charts have been printed for the use of the royal navy and the public.

Fifty-one new Charts have been engraved, exclusive of a series of Pilot Charts for the Atlantic Ocean, explanatory of the winds, currents, and other ocean phenomena for the different seasons of the year.

NEW PUBLICATIONS.—*Tchihatcheff's 'Asie Mineure.'*—My distinguished friend, M. Pierre de Tchihatcheff, who, during eight years of personal researches and nearly twenty years of scientific

and literary labours, made Asia Minor his special domain, has completed his indefatigable labours by two volumes on the secondary and tertiary rocks of that classical region. It is, indeed, fortunate that such a character as Pierre de Tchihatcheff should, however rarely, stand out in striking relief among those men of independent means who enrol themselves in the army of science. The labours of many years, the large expenditure of money, and the risk of life, which he has incurred, in evolving with untiring zeal, the geography, botany, natural history, and geology of the vast country of which our former President, William Hamilton, gave us the first general outline, merit our warmest acknowledgments. Let me further say that I commend these volumes for being not only full of good matter, but as being written in the most pleasing and attractive style. I also specially admire M. de Tchihatcheff for the gallant declaration he makes in his last preface, when he announces that, after all his labours, it is not as an invalid in repose that he takes leave of his readers in offering them his eight volumes on Asia Minor,* with his maps, both geographical and geological (to say nothing of his numerous other publications, including his *Geology of the Altai Mountains*), but as a still vigorous pilgrim, who, being once more on foot, elicits their encouragement and approval as he enters on some new crusade. The man after my own heart is one who, like Pierre de Tchihatcheff, is always struggling onward; and I only regret that my own term of life is so much further advanced than that of my distinguished friend, that I cannot longer expect to make any more of those explorations which it has been the happiness of my life to pursue, in my endeavours to extend, like him, geological and geographical knowledge.

The eulogy of Pierre de Tchihatcheff which the lamented and truly eminent geologist le Vicomte d'Archiac wrote in a letter to me is so true and apposite that I give it here, as being also my own estimate of the value of the works. "I hope," writes D'Archiac, "to be able to show that his works on Asia Minor constitute one of the most remarkable and vast scientific monuments of our age; for among all explorers of unknown lands no one can boast of having, like him, produced such detailed and precise works on all branches of natural science, after traversing in every direction and step by step, during ten years, a wild and difficult region as large

* *Asie Mineure; Description physique de cette Contrée.* Paris. Guérin, éditeur. (Theodore Mornand, 5, Rue Bonaparte.)

as France; and what is more, all this by himself alone, without the material or moral assistance of any Government, scientific body, or association, and entirely at his own cost."

*Whymper's 'Alaska.'**—Of the several works describing distant tracts which have appeared in the past year, none has interested me more than the narrative of the travels and adventures of Mr. Frederick Whymper, in the territory of Alaska and along the course of the great River Yukon. Russian America (now acquired by the United States), though very imperfectly known even to geographers, and almost entirely unknown to the general public, has, thanks to the zeal and enterprise of Mr. F. Whymper, been most graphically described. He has given us an animated description of the vast tract of country watered by the great River Yukon, including many good statistical and geographical data, with sketches of its stalwart Red Indian inhabitants, the whole illustrated by some most effective woodcuts and a very instructive map. Besides the description of the great Alaska and Yukon territory, the author's observations on Vancouver Island and the Archipelago of Behring's Sea present to us in a compact and attractive form much fresh and valuable information. The volume further recommends itself to the reader by a good sketch of the physical outlines of Kamschatka and its lofty snow-covered volcanoes, with an account of the discoveries of Behring and his fate. All the natural phenomena in that region of auroras and wonderful meteorological changes are explained, and the work terminates with a lively description of life as it now exists in California. By it we learn that the unfavourable picture drawn of this virgin country by early emigrants has been entirely changed; and through its settlement by our energetic kinsmen, this prolific region, enjoying a splendid climate, has been rendered eminently productive of all cereals and of the most delicious fruits, which, like the hidden precious metals, simply required the industry of man to be brought forth in abundance.

Delesse's 'Carte lithologique des Mers de France.'—An original and instructive map has recently been published in France by the accomplished Chief Mining Engineer, Professor Delesse, entitled '*Carte lithologique des Mers de France.*' By applying four different tints of light colours to different parts of France, Belgium, and the South of England, the author indicates the portions of these dry lands which shed their waters respectively into the Ocean, the Mediterranean, the Bristol Channel, and the German Ocean.

* '*Travels in Alaska and on the River Yukon.*' (Murray. 1868.)

Then, by other colours, he shows the varied nature of the sea-bottom for a considerable distance off the coasts of these countries; marking, at the same time, by a series of contour-lines, the elevations of land and the depths of the sea. Thus, it may be seen at a glance how narrow is the belt of shallow sea along the Mediterranean coast of France, and how wide is the shallow border-zone around the Atlantic coasts both of France and England. The different mineral character of areas of the sea-bottom is marked by different colours in a clear and instructive way. Shelly deposits, of great service to the farmer, are seen to be connected with calcareous or granitic shores like those of Normandy and Brittany, and to be rare on coasts where argillaceous deposits or sterile sands, like those of the Landes, prevail. This map also indicates, by horizontal curves, the true orography of France and its surrounding hydrographical basins, and also the amount of rainfall, the direction of winds and currents, and the propagation of tides. In short, as a lithological map of the seas around France, this work—which can be consulted with great advantage by seamen and engineers employed in submarine works, as well as by geologists, zoologists, and agriculturists—will prove a valuable help to students as well as to practical men.

Neubauer's 'Geography of the Talmud.'—One of those learned works which make but little stir in the world on their first appearance, but which are found to be of permanent utility to all earnest students, is the '*Geography of the Talmud*,' by Adolphe Neubauer.* a work which gained a prize offered by the French Academy for the best treatise on the subject. While Reland and Lightfoot made very sparing use of the geographical remarks of the Talmudistic books concerning Palestine, M. Neubauer enters into them profoundly; and he gives, from the same ancient records, some interesting facts relating to Babylonia and Mesopotamia which have not hitherto been noticed by historians or geographers. The work itself is one of great learning and minute research; but it contains a preface, written in a clear and agreeable style, which gives a summary of the literature of the Talmud and forms an excellent general introduction to the subject.

Wallace's 'Malay Archipelago.'—Since the days when my lamented friend, John Crauford, made the English public well acquainted with all the leading geographical and statistical features of the

* *La Géographie du Talmud, Mémoire couronné par l'Académie.* Ad. Neubauer. (Paris, M. Levy Frères. London, Williams and Norgate.)

Indian Archipelago, the most remarkable work which has been published is that which has just appeared from the pen of our Associate, that eminent naturalist Alfred Russel Wallace.* As we took an interest in Mr. Wallace's expedition when first planned by himself, and received from time to time papers from him on various portions of his travels, we may well feel a pride in his great success, and in the striking contributions to various departments of science which have been the result of his eight years' wanderings.

As Mr. Wallace justly observes, the vast group of islands extending from Sumatra to the Islands east of New Guinea are equal in the extent of surface which they cover to one of the primary divisions of the earth's surface, although the region in most maps is almost ignored as a geographical whole, being divided between Asia and the Pacific Islands. The Malay Archipelago extends for more than 4000 miles in length from east to west, and is about 1300 in breadth from north to south. Its area is equal to that of all Europe and great part of Western Asia combined, and some of its islands are larger than France or the Austrian empire. The region, moreover, is exceedingly diversified, both in physical features and in animal and vegetable productions. One of the chief volcanic belts upon the globe passes through the archipelago, and produces a striking contrast between the scenery of the volcanic and non-volcanic islands. The organic productions are, to a great extent, peculiar, and remarkable for the beauty of their forms, and, in the case of the fruits and spices, their value to mankind. The task which Mr. Wallace set before him was to visit all the principal parts of this great equatorial region and explore its physical geography and natural history—a task which employed him during eight years from 1854 to 1862.

The result of Mr. Wallace's researches which chiefly interests us as geographers, is the establishment of a natural division between the eastern and western portions of the archipelago; a sketch of which, with the principal facts and reasonings leading to it, was given by him in a remarkable paper read before us soon after his return, in June 1863. The first suggestion of this division seems to have been supplied by the animal productions, which are so widely different in the western and eastern halves of the Archipelago, the great islands of Sumatra, Java, and Borneo, on the one hand, containing the elephant, rhinoceros, wild cattle, and a vast number of genera and species of mammals and birds allied to, or

* 'The Malay Archipelago; the Land of the Orang Utan and the Bird of Paradise.' 2 vols. (Macmillan and Co. 1869.)

identical with, those of Continental Asia, whilst New Guinea and the Moluccas are destitute of all these Asiatic forms of life, and, in their stead, contain numerous genera of Australian types. The two faunas thus wonderfully contrasted nearly meet at a central line, which runs north and south along the channels between Borneo and Celebes, and between the small islands Bali and Lombok in the Java Sea. Between the two islands last mentioned the channel is only 15 miles wide, yet the two sides of this narrow strait differ as essentially in their animal life as Europe does from America.

In establishing this division Mr. Wallace applies the same principle which is followed by some European geologists and naturalists, in working out the relations of animal life and their bearings on the former geological connexion of countries now separated by the sea; for example, in the case of the British Islands and the continent of Europe. The fact that our islands are peopled by animal and vegetable forms, with few exceptions identical with those of the neighbouring continent, led, in the first place, to the conclusion that they were united by land at a period not further remote than the peopling of North-Western Europe by its present species of organic beings; and this hypothesis has now been confirmed in a remarkable manner by geological investigations of post-tertiary deposits, which prove that this connexion must have existed. The shallowness of the intervening sea is also accepted as an argument in favour of the recent union of these land areas. Mr. Wallace assumes, with many other eminent naturalists, that this principle may be carried further, and that when the terrestrial animal productions of islands or islands and their neighbouring continents, are dissimilar from each other, it may be concluded that there has been no connexion between them in recent geological times. It must be allowed that some facts lend great support to these conclusions; for example, it is found that where there is great dissimilarity in the organic forms between lands compared in this manner, they are usually separated by a deep sea instead of a shallow one; and, if all geological changes had been slow, the depth to which the sea-bed had sunk might be taken as a kind of rough measure of the lapse of time. Applying this test to the Malay Archipelago, Mr. Wallace has found that the seas lying between the great islands of Borneo, Java, and Sumatra (in short, all the islands having Asiatic forms of life) and the Asiatic continent, have a maximum depth of not more than 50 fathoms: and, at the other extremity, New Guinea and the neighbouring islands are connected with Australia by a similar shallow sea. The space, how-

ever, between these two areas of lands and shallow sea is occupied by a very deep sea, and the Australian types seem to diminish in numbers, in advancing westward from New Guinea, as we approach the channel that divides the "Austro-Malayan" from the "Indo-Malayan" portions of the archipelago.

For the details of this remarkable subject, which unites the science of Geography with those of Geology and Natural History, and also for the curious speculations on the modifications of species, I must refer you to Mr. Wallace's book. So well has he elaborated his leading generalization, and so thoroughly has he made it his own, that already other writers are beginning to term the dividing channel between the two halves of the archipelago "Wallace's line." In addition to this ingenious speculation, the two volumes contain a store of interesting and important facts relating to the physical geography of the various portions of the archipelago, and to the native inhabitants, climate, and productions of the remote islands which he visited.

Much, however, as Mr. Wallace is to be admired as a great naturalist and a most attractive writer, I cannot, as an experienced geologist, subscribe to his assumption that *all* former changes of the outline of the earth were produced slowly. On the contrary, it seems to me that the profound chasm which he describes as existing between the islands of Bali and Lombok has more probably resulted from one of those deep and sudden ruptures of the crust of the earth which the field geologist meets with so very frequently. It would, indeed, require a detailed examination of the cliffs and shores of these opposite islands (a point on which the author is silent) before we can refer the enormously deep channel which separates them to the ordinary action of a marine current during countless ages. Having, at our last anniversary, endeavoured to combat the doctrine of uniformity of causation through all time, I will follow up the subject towards the end of this Address by comparing some of the present with the former changes of the earth's surface.

Bickmore's 'Travels in the East Indian Archipelago.' *—In reference to this region, it also gives me pleasure to call attention to the well-filled volume thereon by Mr. Albert S. Bickmore. This accomplished young American traveller, who, after an absence of four years from the United States, gave us on his way homeward a very lively and

* *'Travels in the East Indian Archipelago. By A. S. Bickmore.'* (Murray, 1868.)

attractive sketch of his journey across a large portion of China,* between Canton and the River Yang-tze Kiang, of which we had no previous description, has recently published a work, giving a full account of that portion of his wanderings relating to the Indian Archipelago.

Besides the talent of describing, in a clear and entertaining manner, the people and their customs, particularly as regards Sumatra, of which region we had previously very little knowledge, Mr. Bickmore has really great merit as a naturalist; the chief object of his voyage having been to collect the rare shells of Amboyna, first figured and described by Rumphius—adding considerably to the number of species, and so enriching the museums of his native land that his countrymen have most properly rewarded him by making him Professor in one of their Universities. He has also received an important post in connexion with the proposed new State Museum of New York, towards which the Legislature has lately voted a large sum of money, and which is to occupy one of the best positions in the city, at the Central Park.

One fact mentioned by this author, in describing the Minahasa district in the Celebes, is very creditable to the labours of the missionaries. But a few years ago the people of this tract were notorious cannibals; they are now greatly civilised, and, in having been taught to read and write, and adopt the precepts of Christianity, all their bloody sacrifices have been abandoned. Thus, whilst in 1840 one only out of sixteen of the inhabitants was a Christian, now the relation is as two to five. Besides these and many other descriptions of the people for the general reader, the geologist will find much to interest him in Professor Bickmore's account of some of the phenomena of that region of earthquakes and volcanoes.

Keith Johnston's 'Elementary Atlases.'—These cheap Atlases, which I noticed in my last year's Address, continue to be published by our talented and enterprising associate Mr. A. Keith Johnston. I have before me, at the present time, three of the physical maps forming part of the series; two illustrating the physical geography of the Mediterranean Basin, and the other the Currents of the Ocean. The execution of these small maps, in which so much information is conveyed by means of colours, contour lines, and shading, is admirable, and their author is entitled to all credit for

* See 'Proceedings,' vol. xii. p. 51.

placing such means of geographical instruction within the reach of even the poorest classes.

Pellart's 'Hand Atlas.'—Messrs. A. Fullarton and Co. have commenced the publication of a new collection of Maps, with descriptive letter-press, under the title of 'A Descriptive Hand-Atlas of the World,' edited by J. Bartholomew, F.R.S.E. This work, of which four parts have appeared, seems to me to contain much geographical information in a convenient form, useful not only to the geographer but to the student of other branches of science and to merchants. One of the maps illustrates all the principal physical phenomena of the earth's surface, and the distribution of races and religions. The other more detailed maps are remarkable for the clearness of their execution.

ARCTIC RESEARCHES.—Having on various occasions dwelt upon the progress annually made in North Polar explorations, it was my duty at the last anniversary to direct special attention to the effort then about to be made by the Germans, as incited and guided by our medallist, Dr. Petermann, to advance into the Polar basin by the eastern and north-eastern coast of Greenland. Although the result was not commensurate with the anticipation of the designer, yet the advance was notable when we reflect upon the fact that the little Norwegian schooner, the *Germania*, under many adverse circumstances, reached so high a latitude as $81^{\circ} 05'$.

While such was the endeavour on the east coast of Greenland, the Swedish Government, following up the spirited efforts it had made, to its great honour, since 1861, fitted out a well-formed scientific expedition, to develop the natural history and physical geography of the western and northern shores of Spitzbergen, and, further, to endeavour to penetrate northwards from Spitzbergen towards the Pole. It must be recorded that the initiative in these remarkable Swedish Arctic explorations was made by M. Otto Torrell, in 1858, who visited, in that year, the western parts of Spitzbergen, in company with M. A. E. Nordenskiöld, on board a hired yacht. This expedition was chiefly engaged in Natural History researches and Geographical explorations. The general physical investigation was only commenced in the Government expeditions of 1861 and 1864, the latter under the command of M. Nordenskiöld. The endeavour to navigate the icy sea towards the Pole was a new feature in the expedition of 1868, and the plan of it was quite original, inasmuch as this effort was not to be made before the autumn, i. e. in

the season when former expeditions had ceased their labours. The grounds were, that it was to be inferred that, at this period of the year, the effect of the summer sun in melting and dissipating the ice-floes would have produced its greatest results, and that then, if ever, a passage might be forced, to be followed by a rapid return. After reaching the latitude of $81^{\circ} 42'$, the highest ever yet authentically recorded as attained by any ship, the Swedish screw-steamer sprung a leak, in consequence of a shock against a huge mass of ice, and was with great difficulty saved; and, after refitting in an icy fiord, was just enabled to reach home.

The natural history results alone, which the Swedes have obtained, have in themselves well repaid the cost of their endeavours, by the copious additions made to our knowledge of the geology, zoology, and botany of Spitzbergen; the only previous exploration conducted in a similar systematic manner being the *Expédition du Nord*, which, in the years 1838 and 1839, the French carried out under Gaimard. But what specially calls for our admiration is, that the Swedes are animated by the resolve to make another great effort, thus really taking the lead in the resolute endeavour to solve the great northern problem; and for their noble efforts in this cause, our Council have most rightly adjudicated the Founder's Medal of this year to M. Nordenskiöld.

The sketch which M. Nordenskiöld, the scientific chief of the expedition of 1868, in conjunction with the naval commander, Captain von Otter, sent to us, and which was read to our Society, has elicited the warmest approbation of naturalists and geographers; and from the data which have been already obtained we have a right to anticipate, that if it be given to man so to penetrate within the Arctic Circle as to determine the real nature of the great area around the North Pole, Nordenskiöld and his companions have a fair chance to achieve it. One great scientific merit of this Swedish enterprise has been the completion, in 1864, by M. Nordenskiöld and his assistants, of the preliminary survey for measuring an arc of the meridian in these latitudes, so long ago strenuously advocated by General Sabine. Already nearly the whole of the coasts, deep bays and channels of this group of islands have been surveyed with precision by these courageous and successful explorers, and the excellent map they have produced gives evidence of the amount of their labours.

The grand subject of North Polar survey was clearly put before the French public last year by our zealous and accomplished

foreign Associate, M. Malte-Brun, in his work, entitled '*Les Trois Projets*'—meaning thereby the English, German, and French propositions for advancing towards the Pole—in which he fairly examined the respective values of the schemes of Sherard Osborn by Baffin's Bay and Smith Sound, as largely dwelt upon in our Society—that of Spitzbergen, as advocated by Petermann and supported by Sabine, and that of Behring Straits, as projected by Lieutenant Lambert, of the French Navy.

As I have before treated of these questions, and also of a fourth project, or that by the east coast of Greenland, as suggested by the whaling Captain Gray, I need not now revert to them. I have, however, the truest satisfaction in announcing to the scientific world that the scheme which our Government declined to adopt is now in the act of being carried out by the spirit and at the expense of a Scottish gentleman and a Fellow of our Society.

Mr. James Lamont, member for Bute-shire in the last House of Commons, who formerly explored the Spitzbergen seas and gave to the reading public an animated sketch of walrus hunting, adding also much to our acquaintance with the fauna, as well as the geology of the Arctic Circle, left the Clyde in April in a screw-steamer of 250 tons' burthen, built, fitted out, and manned, at his own expense, with a seasoned crew of ice-men, a practised captain, and a naturalist, in which he is now making the bold endeavour to succeed, where others have failed, in penetrating further towards the North Pole.* We geographers may then rejoice in the fact that the electors of Bute should have rejected the services of Mr. Lamont, for, by losing his seat in the Senate, he has thereby been enabled to devote his zeal, ability and purse to our cause.

I forbear to attempt to predict what the determination may prove to be respecting the real physical condition of the region around the North Pole. Whether it be for the most part a huge watery basin,

* Mr. Lamont's vessel, the *Diana*, passed through the Crican Canal, went on successfully through the Caledonian Canal to Inverness, whence he wrote to me on the 20th April, stating that he hoped to be at Tromsø on the 1st May, and would then have full four summer Arctic months at his disposal. I learn from M. Lamont that he will endeavour to pass by the north-east side of Spitzbergen; hoping that, if he can once reach Gillies Land, he may be able in his steamer to proceed up its west coast for a great distance northwards. His preconceived opinion, founded on the repeated failures of his precursors to effect an entrance into the ice by the north-west, is that the east side of Spitzbergen is the proper route. If he should succeed in proving that lands extend towards the Pole far beyond Nora Zembla, he will have given us important new geographical data which will materially circumscribe the area of the supposed open Polar Sea. In the mean time let us heartily applaud this spirited and noble enterprise of a Scottish gentleman.

from parts of which the many whales migrate southwards to Smith Sound and Baffin's Bay, or whether it be encumbered with lands, it would appear to be certain, from the fragments of rocks and earth which the Swedes have recently found floating on the ice from the north towards Spitzbergen, that in that direction, at all events, there are lands, which may be a continuation of those of Arnheim and Wrangel, which range from off the northern coast of Siberia, and were, indeed, first sighted by our own Kellett, and subsequently delineated more extensively by the captain of the American whaler, to whom I adverted in last year's Address.

Among the discoveries which have been made in the natural history products of the Polar Regions, none has more attracted men of science than the fact, that the subsoil there contained in several parts the remains of fossil-plants of a warm climate. In their earlier researches the British Arctic Officers—of whom General Sabine is the earliest type left—collected fossils which were referred to that old carboniferous period when tree-ferns and palms flourished; and subsequently animals of the age of the Lias were also discovered. It is of late years, however, that, through the collections made in Greenland by our navigators during the search for Franklin, and subsequently by Mr. Whymper, and in Spitzbergen by the Swedish Expedition, that Dr. Heer, the celebrated botanist of Zurich, has been enabled to describe a rich flora of Miocene age, of which, even in the collection of Mr. Whymper, 95 species of plants indicative of a climate similar to South Italy have been described. Such being the fact, geologists—who ingeniously endeavoured to account for the former existence of an exuberant flora in the now icy Arctic region by an appeal solely to changes of physical geography of the lands and waters—are now dragged into the much grander cycles of certain astronomers, who endeavoured to account for the wonder by carrying us back hundreds of thousands of years, to a period when the earth, by a deviation of its axis, presented its now Arctic and Antarctic regions to the direct action of the rays of the sun.

ANTARCTIC OCEAN. —Our endeavours to induce the Government to maintain the renown of our navy in the exploration of Polar Seas, by completing the work, towards which we had already accomplished so much, namely, of determining the geography and natural history of the North Polar Region, were made, in great measure, because we well knew that in a very few years England, and indeed all civilized maritime nations, would be called upon to send

astronomers to observe the transit of Venus amid the difficult and less known icy seas of the Antarctic Circle. We argued* (and I think most justly), that on the arrival of the time when it would be necessary to establish observatories in that region, scarcely a naval man would be left skilled in ice-navigation, or who had still the power of instructing others in it. Hence we strongly urged that we should enter upon that great and scientific Antarctic undertaking under enormous disadvantages.

That period, however, of Antarctic research is now fast approaching, and all Arctic maritime practice of the Royal Navy for North Polar purposes having been refused, we find that the preparatory arrangements for the observations of the Transits of Venus in 1874 and 1882 have already undergone, in the Astronomical Society, the luminous scrutiny of Mr. Airy, the Astronomer Royal, whose paper on the subject was followed by observations by Captain Richards the Hydrographer, Mr. H. Toynbee, Rear-Admiral Ommanney, Staff-Commander Davis, Mr. E. J. Stone, and Mr. Warren de la Rue. The geographical portion of the question has indeed been well put before our Society (in which it underwent a very animated discussion) by Staff-Commander Davis, himself an Antarctic explorer, and one of the former associates of that eminently distinguished Polar navigator, Sir James Ross.

That preparatory expeditions must be fitted out to secure the establishment of proper observatories, in order to clear up this great datum line in the physics of the universe, I must consider certain, when I quote the Astronomer Royal, who, speaking of the Expedition sent into the Pacific to observe the transit of Venus in 1769, justly says, that it has ever since been esteemed one of the highest scientific glories of England in the last century. Surely then our country, largely as it has advanced in physical science in the last hundred years, ought much more strongly to feel the urgency and desirability of this new expedition. But, alas! I cannot but feel a misgiving (notwithstanding the confident hope of my valued friend the Hydrographer) as to the national endeavours which will be made, when I know that so important a branch of science as that of North Polar research, which did not carry with it the vulgar recommendation of usefulness and profit, was slighted by too many of my countrymen, with whom the common aphorism of "*cui bono*" is a sufficient apology for a shabby abstinence from much which would ennoble our nation.

* See my Address, 1865, '*Journal*,' vol. 35, p. clxxxii.

Europe.—Switzerland.—I have received, as in former years, an account of the progress of the national survey of Switzerland, from our learned and active Corresponding Member, M. J. M. Ziegler, of Winterthur. The able men of science, who have been engaged in the triangulation of this interesting portion of Europe, and in fixing by an elaborate series of hypsometrical observations and exact levelings the true profile of this rugged land in various directions, have not yet reached the end of their labours. At present it is intended to continue the topographical Survey of those parts of the country whose cantonal maps are of an earlier date than 1831. To the name of General Dufour, who is so widely known in connection with the federal maps of Switzerland, must be added those of Professor Wolf and Messrs. Plantamour, Denzler, and Hirsch, who have all co-operated in the Swiss Survey. In 1867 the work of the triangulation of Switzerland, in connection with the surrounding countries, was brought to a close by M. Denzler, and the operations of the *nivellement de précision* were so far advanced that the hypsometrical network for the West of Switzerland may be considered as now terminated, embracing the districts from Geneva to Basle. These geodetical operations have become of more general geographical importance since the establishment of the International Geodetic Association for Central and Southern Europe, which a Swiss delegate always attends, and through which the surveyors of the various states are enabled to connect their work so as to lead finally to that desirable result,—a perfectly accurate map on a large scale of the whole region.

The Federal Government, as I am informed by M. Ziegler, has recently decided to undertake the publication of fac-similes of the original surveys of Switzerland, which are on a scale of 1 in 50,000 for the highlands, and 1 in 25,000 for the lowlands. These will extend to several hundred sheets of maps, similar to those of our own Ordnance Survey Maps, and will be a lasting monument of the scientific enterprise of this enlightened nation. The Geological Survey of the country, under the directorship of Professor B. Studer, is also in active operation, and its officers are publishing numerous valuable maps.

Italy.—The Italian Geographical Society shows vigorous signs of life, under the guidance of its excellent and indefatigable President, my friend the Commendatore Cristoforo Negri. We trust his genial enthusiasm and unwearied labour will have its reward in the solid

and permanent establishment of this Society. Barely two years old, it already numbered, on the 23rd of April, 662 effective members, including 21 Life Members. Two numbers of the Society's Journal have already been issued, presenting an aggregate of some 700 pages, and a third is in a forward state.

Among the papers already issued may be mentioned a valuable one by the Marchese Antinori, on his own travels and those of Signor Piaggia in Central Africa, which was noticed in my opening discourse in November last; an account, by Signor O. Beccari, of his travels in Borneo; a sketch of the voyage of the Italian frigate *Magenta* round the world, by Professor Henry Giglioli, coadjutor of the lamented Senator F. de' Filippi, and successor to the charge of the scientific branch of the Mission, on de' Filippi's death at Hong Kong, February 9th, 1867; a Journal during the Expedition to Abyssinia, kept by Captain Egidio Osio, of the Italian staff, who was attached to Sir Robert Napier's head-quarters; a paper on the Hydrography of the Nile and Central Africa, by the eminent engineer Elia Lombardini; an interesting letter on old Venetian intercourse with Abyssinia, by Signor Guglielmo Berchet, who has already extracted so much that is valuable from the great stores of the Venetian archives; a grammar of the language of the Denka tribe on the White Nile, by Signor Giovanni Beltrame; and an interesting and appropriate discourse on the Italian travellers of the present century, by Professor Gastano Branca. It will be for the young Society to take care that in future the achievements of Italian travellers have prompter justice done them both at home and abroad.

The narrative of young Signor Beccari is a concise sketch of what was evidently a series of journeys of great interest, in the interior of Sarawak and the adjoining regions of Borneo. Unfortunately he does not seem to have combined any precise geographical observations with his especial object, the collection of botanical and zoological specimens. With regard to the voyage of the *Magenta*, the general account of the expedition and its scientific results is under preparation for the Italian Government, by Professor Giglioli, assisted by contributions from Captain Arminjon and his officers. The zoological collections brought home by the Mission are in the Museum at Turin, and embrace some 2000 species, chiefly vertebrates and the lower divisions of the invertebrata. Hydrographic surveys were executed in the channels of Western Patagonia; charts of Hail Bay and the English Narrows, from these surveys, have lately been published by

the Ministry of Marine. Many ethnological specimens were collected, such as skulls, arms, and implements, besides nine fine Peruvian mummies belonging to a tribe of Aymaras, and found in the vicinity of Cobija in Bolivia. These are believed to be the first of the kind which have reached Europe. Their heads are compressed *upwards*; in this respect contrasting with the Quichua mummies found near Lima, of which also a good series was procured.

AFRICA.—In relation to the interior of Southern Africa and the probable line of research which Livingstone may have followed from the Cazembe country, near the southern end of the Lake Tanganyika, whence he dated his last letter in December, 1867, I have seen cause to modify the views I published regarding his return *via* Zanzibar, and to revert to the opinion I expressed on the 27th April, 1868.*

In a letter from Dr. Kirk at Zanzibar, dated the 5th March, it was very disheartening to learn that by no one of the many traders in ivory who had reached the east coast from the country of Unyamwezi—which the great traveller must have traversed if he had advanced, as we supposed, by the eastern shore of the Lake Tanganyika—had a scrap of intelligence been received respecting him. The theory which I have now formed to account for this entire want of information is, that he has quitted the eastern region entirely, and has been following the waters which flow from the western side of the lake. These will lead him necessarily across a large unknown region, to emerge, I trust, at some port on the western coast. In this case, being in a country the inhabitants of which have no intercourse with the Zanzibar territory, we can never more expect to learn any tidings of him from the eastern seaboard. We already know, however, that he had been living with some very hospitable and intelligent Arabs in the interior, and from them he may have learnt that the Lake Tanganyika was really barred up at its northern end, by mountains through which its waters could not flow into the Albert Nyanza of Baker. Or he may, indeed, have satisfied himself by measurement that the altitude of the Tanganyika was of about the same height as that determined by Burton and Speke, and therefore much lower than the Equatorial lakes. In either case, he would abandon the northern search which, at our last anniversary, I believed he might make. Being

* See 'Proceedings,' April 27, 1868, p. 184.

aware that he was in good health and spirits when he last wrote, and satisfied with his kind reception by the Arab traders; I can see no ground whatever for despondency; and, in the absence of all other information, I suggest that he has been following the waters which are laid down upon the old map of Duarte Lopez prepared in the end of the sixteenth century, and that he will successfully emerge from Africa on the same coast as that where he terminated his first great traverse of South Africa.

According to Mr. Major, who called our attention to the above-mentioned remarkable document (which is in the British Museum), this is the very first map on which the interior of Africa was laid down from sources independent of Ptolemy. Although drawn by an unscientific hand, it contains more data which have been shown to be true by recent discoveries, than any of the maps which either preceded or followed it. Those which have since been published, up to the period of actual exploration, have been more speculative combinations from it and from Ptolemy, and consequently inaccurate. Of this map of Duarte Lopez, published in 1591, our Secretary, Mr. Major, has also published a reduction in his admirable 'Life of Prince Henry the Navigator.' This Duarte Lopez, a Portuguese, resided in St. Paul de Loanda from 1578 to 1587, a period at which his countrymen were well established on the Congo, as well as in Sofalá and Mozambique on the east; and during those nine years he was able to gather a large amount of important geographical information from native travellers. On this map are laid down the two great lakes Victoria Nyanza and Albert Nyanza approximately in their right positions on the equator, with another great lake due south of the Albert Nyanza. This southern lake Mr. Major believes to represent a union of the two lakes Tanganyika and Livingstone's Nyassa, probably through the information being derived from the conflicting accounts of travellers coming from different parts of the interior to the west coast. It is unnecessary here to point out those features in the old map which in uniting all the southern waters with those of the Nile basin are probably inaccurate. It is enough to indicate that it is decisive as to the main point, that rivers flow from this lake to the west; and that as regards the now ascertained phenomena respecting the northward course of the watershed of the Nile waters, all the main data are in accordance with modern observation. In our present uncertainty respecting the size of the Albert Nyanza, it is, indeed, interesting to observe that the lake which corresponds to it in Lopez's map is

stated in his book to be 200 miles across (per traverso). The length is not mentioned. From it are made to flow not only the Nile, which it has received from the southern lake, but the Zaire or Congo. So early as 1519, Enciso, in his '*Suma de Geografia*,' had spoken of a great lake, from which flowed both the Manicongo and the Nile; and Barros, in speaking of this same lake from which these two great rivers flowed, gives astounding accounts of its size, the great ships which sailed on it, and of a civilised people around it who lived in stone houses equal to those of the Portuguese, and so forth. But, due allowance being made for exaggeration, we see in it the indication of a central lake of immense extent.

On this map of Lopez was also laid down for the first time the great empire of Monomoezi or Uniamuezi, occupying its right position between the Victoria Nyanza and Lake Tanganyika.

But I will not now dwell on the various claims to credibility which this remarkable map presents, as they have been already well set forth by Mr. Major. My object is to call attention to the curious information it affords respecting those regions about which we hope to receive due enlightenment on the return of Livingstone, and which will, as far as the Nile basin extends, be thoroughly laid open by Sir Samuel Baker, should he—through the patronage and magnificent support of the Viceroy of Egypt—be enabled to carry out his grand project of navigating the Albert Nyanza in a steamer, of bringing into order the uncivilised and ever-warring native chiefs east and west of the White Nile, and of entirely suppressing the slave-trade in that region.

When we reflect upon the statement of Lopez which accompanied his old map, that the lake—which he lays down as occupying the same equatorial position as the Albert Nyanza—had a width (i.e. from east to west) of 200 miles, I am led to suggest, that the detached large sheet of water heard of by the brothers Poucet, and already inserted in a map by Petermann, may prove after all to be simply the western end of the Albert Nyanza, and a part of that great internal water-system which gives birth to the Nile.

South African Gold-Fields.—Whilst I adhere to the opinion I expressed last year, that the Ophir of Solomon was probably in that part of South Africa which lies between the southern affluents of the Zambesi River and the northern feeders of the Limpopo, in which some gold has recently been discovered, I did not and do not hold out any incitement to speculators to look to that region as one which

will prove rich in produce. Many countries, like Bohemia and Spain in Europe, which formerly yielded notable quantities of gold, are now barren of it; the ore having been largely extracted in past centuries. To what extent the gold collected in the days of Solomon, or in ages long after by the Portuguese settlers, did exhaust these alluvial auriferous deposits of South-eastern Africa, in which gold might be easily worked, is unknown; but it is certain that the information recently derived from the Government of Natal, and obligingly communicated to this Society by the Secretary for the Colonies, affords but slender hopes of the realization of profitable diggings in the vicinity of that colony. At the same time it is to be recollected, that as yet none of the parent gold-bearing rocks from which such deposits have been derived have been penetrated; but even if so commenced we can scarcely expect that such works can as yet be profitably carried out in the wild, distant, and uncivilised regions where such parent rocks occur.

Asia—Central Asia.—The subject of Central Asia has still more than in preceding years occupied our attention. For, whilst the Russians have made very extensive surveys in the Thian Shan Mountains and far beyond their conquests along the course of the Jaxartes or Syr Daria and in the Khannat of Bokhara, our Medallist, Capt. Montgomerie, has, through the agency of his well-instructed native Pundits, completed a geographical survey of the south-western mountainous regions of Thibet, which was entirely unknown to our predecessors, and in which extensive gold-fields occur.

Thanks to the measures taken by our energetic Associate, Mr. Forsyth, to propitiate the present ruler or Kooshbegie of Eastern Turkistan, Mr. Shaw, a British tea-planter from Kangra, has been enabled to traverse all the lofty mountain passes north of Leh, and has carried his caravan of merchandise into the Yarkand territory. As this is the first time in which such a success has been achieved, and as all that fertile region has been entirely abandoned by the Chinese, we may reasonably infer that our tea-plantations of Hindostan may in future supply the Mahommedan inhabitants of the vast region formerly known as Chinese Tartary with the indispensable article of tea, which they have scarcely tasted since they threw off the Chinese yoke.

If the extensive chain of the Thian Shan, which the geographer Semenov has in great part delineated, should be fixed upon as

the eastern boundary of the Russian empire in Central Asia, our allies may on their part carry on from their frontier a profitable trade with the Kooshbegie, or chief, of this fertile region of Eastern Turkistan, whilst the British may send thither the Indian tea, *et* Cashmere, in exchange for the many valuable products of that region.

The subject of trade routes between Turkistan and India has indeed occupied the attention of the Society on two evenings during the present session, and it is a source of pleasure to all geographers to find how surely, though slowly, we are becoming acquainted with the regions beyond the northern frontier of India, across which European travellers in the middle ages frequently passed on their way to China. With regard to the itinerary of Mahomed Amin, a Yarkand merchant, communicated to us by Mr. Hayward, I am informed by Colonel Henry Yule that this was the same person who was guide to the unfortunate Adolphus Schlagintweit. According to Colonel Yule, to whom I am indebted for nearly all the information in the following part of my Address, the routes had indeed been already in print, among the Appendices to that interesting 'Report on the Trade and Resources of the Countries on the North-West Boundary of British India,' by Mr. B. H. Davies of the Indian Civil Service, which was printed at Lahore seven years ago (1862). This Report was printed in 1864 by order of the House of Commons, on the motion of Mr. Henry Seymour, but from the reprint were excluded the whole of the valuable original data constituting the Appendices, as well as the whole of the maps! For this saving, which was not an economy, I do not know which department we have to thank; but, from this cause, the routes contained in the original Lahore Report have been scarcely accessible in this country, and it may be worthy of consideration whether we should not do well to reprint others which are to be found in its Appendices, as well as that of which Mr. Hayward sent us a copy.

The maps accompanying the Lahore Report contained a praiseworthy endeavour by Captain Lumsden, of the Quartermaster General's Department in India, to embody the information contained in these routes; and Colonel Walker, Superintendent of the Trigonometrical Survey, has also very recently made large use of that information in his 'Map of Turkistan, on four sheets, based on the Surveys made by the Russian and British Officers up to 1867, and on the most recent Itineraries.' This work of Colonel Walker's

does not enter into great topographical detail, but it is invaluable as a combined view of the sound results obtained up to the latest date, and marks a step in our cartography of that region such as has not been made for nearly thirty years. In fact, between the deviations introduced by the Schlagintweits, and the misleading guidance of the anonymous MS. of the Russian archives, discussed at our meetings by Sir Henry Rawlinson and the late Lord Strangford, the maps of Central Asia published by some eminent foreign geographers of late years had in some important points rather retrograded than advanced in accuracy.

One result of the new information which Col. Walker has co-ordinated in his map has been greatly to enlarge the width of the little-known mountain country between the Upper Oxus Valley and the basin of Eastern Turkistan, and to throw new light upon the territories occupying this interval, which, according to Colonel Walker's map, expands to 386 miles. "Hence it is now much easier," says Colonel Yule, "to account for the great number of days assigned by Marco Polo, Benedict Goës, and all the Oriental itineraries, to the passage between Eastern and Western Turkistan."

"Between Yarkand and the plateau of Pamir, again," as Colonel Yule reminds me, "our maps had nothing to show implying human occupancy beyond one or two names resting on questionable authority, and representing one knew not what, of which *Karcha* was the most prominent. Nor had we any knowledge of settled towns and villages in those mountain recesses. Yet the old Chinese pilgrims to India, whose route often lay this way, speak of principalities which must have lain in this region. Such, in particular, is the kingdom of *Khiçmanto* (*Khasanthe*), visited by Hœi-seng in 518, and by the more celebrated Hsuen-thsang in the following century, when descending from Pamir.* The country, according to his description, produced little rice, and few fruits and flowers, but abundance of wheat and pulse. The population was small, and the people somewhat rude and violent. But they must have attained some degree of civilisation, for they possessed a written character and some ten Buddhist convents. Their Prince styled himself *Chino-Dees-gutra*, 'Son of China and of the God,'—a title accounted for by a romantic tale like that of the paternity of Romulus."

"This kingdom, which was reckoned very ancient in the seventh

* *Hitter*, vii. 498, 503; *Hsuen Thsang, Mem. sur les Contrées Occidentales* by Julien II., 209 seq.

century, was doubtless identical with the modern province of Tashkurghan, formerly called Sarikul, which appears in Mahomed Amin's Routes, and is described by Pundit Munphul in one of the valuable Appendices to the Lahore Report.* That a district bearing the name of Sarikul existed on the eastern face of Pamir was known indeed, for it is mentioned by Moorcroft, and appears in the Tables of the Jesuit Missionaries, but any distinct knowledge regarding it appears first, I believe, in the Lahore documents.

"These inform us that Tash Kurghan (which is properly the name of the chief place of the province) contains several fertile valleys, flanked by high mountains, whose peaks bear up perpetual snow, or by lower ridges subject to snow-falls only in the depth of winter, and affording fine pasture to large herds of shawl-goats, sheep, yaks, cows, camels, and horses. The province is stated by the Pundit to extend 250 miles from the Karakorum Range, on the south, to the Kizil-art Range, on the north, and 100 miles from the Pamir Range, on the west, to Chiraghtang, on the banks of the Yarkand River, on the east. These dimensions require modification; for, according to Colonel Walker's draught of the province, from the slender data yet attainable, the greatest extent from north to south will be about 112 miles, and that from west to east about 140. The capital, Tashkurghan, is stated to be a very ancient city, round in form, more than a mile and a half in circumference, and with walls built of unusually large blocks of hewn stone, situated in a plain. Its crops consist of wheat, *Bajra* (one of the tall Indian millets, *Holcus spicatus*), and peas; its fruits, a few apples and apricots.

"The name of *Tashkurghan*, meaning the 'Stone Fort,' is apt to suggest the possibility of its being Ptolemy's famous *Turris Lapidea*, which was so notable a point in the mercantile route to ancient China. It is difficult, however, to reconcile the geographer's indications with a position so far to the south, and the name is too common a one in Turkistan to be of value in identification.

"I may here refer to the report which Mr. Johnson brought back from Khotan of the existence of an open road from Ilekhi, round the eastern extremity of the Kuenlun Mountains, by which wheeled carriages could pass from the Himalayas direct into the plains of Central Asia. Now, there is a very curious passage in Moorcroft's 'Posthumous Papers' which records the same report as to a cart-road,

* *Report, &c.*, Append. p. cccxxvi. seq.

† The *Karobu* of our maps appears to represent *Karu Su*, "Black water," the name of one of the rivers running down from Pamir.

and gives even greater extension to it. I quote from the first volume of our 'Journal' (p. 243):—"The trade between Hindostan and Khotan was formerly very extensive; and it is even said, though, I presume, rather figuratively, that a loaded cart could go all the way from Nugeebad (*Nujabadd*, near Hardwar?) to Surookee, in the mountains of Khotan." And, in a note, Moorcroft adds that this road was reported to have passed by Rudokh and Gartokh. The details of Moorcroft's information on this matter were probably incorrect, for it does not seem consistent with ascertained facts, as exhibited in Colonel Walker's map, that there should be a road passable for carts from Rudokh, on the Plains of Chanthang, to Surikia* (which is the valley of the Karakash River, below Suget), and the direction indicated by Johnson, *via* Polu and Kiria, is quite different.

"Moorcroft's note proceeds to mention a remarkable relic of a regularly made and paved road, which he came upon in Gurwal, in 1812, on the Indian side of the Himalaya, and which was attributed by an old peasant to an unknown Badshah or Emperor. He had heard, he said, that in ancient times much commerce was carried on by it between Hindustan and some very distant countries. Moorcroft suggests the possibility that this might be a relic of a former imperial road to Khotan. His indication of the site is that it lies "a few kos, as far as memory serves, to the north-east of the village of Bundalee, which lies (he conceives) to the north-west of the ruined fort of Chandpoor," and not very far, apparently, from the Pindar River. It would be worth while to call the attention of Colonel Walker to this notice of Moorcroft's."

Burmah and China.—The Bhamó Expedition.—The expedition despatched last year by Colonel Fyche, the Chief Commissioner of British Burmah, to communicate with the new Mahomedan rulers of Yunan, and to endeavour to re-open the trade between that province and the Irawadi River, by way of Bhamó, met with many difficulties and delays. Captain Sladen and his party eventually reached Momein, the frontier city of the Mahomedan Government, and were received with great cordiality by the Governor. But he so strongly discouraged their advance to Talifu, on account of the still disturbed state of the country, that Captain Sladen felt apparently that he could not, consistently with the strict injunctions of

* This, however, is not quite certain, looking to Mr. Johnson's observations in the 'Journal of the Royal Geographical Society,' vol. xxvii, page 2, line 6.

his own Government, risk the complications that might result from an advance in opposition to the Governor's advice. Nevertheless, as Captain Sladen resided seven weeks at Momein, we may look for much valuable information when his Report is received. One somewhat surprising fact we learn, viz., that Momein is estimated to stand at some 8000 feet above the sea-level. The only Report of the expedition which has yet reached us is one printed at Rangoon, by Lieutenant Bowers, apparently a retired officer of the navy, who accompanied the expedition as representative of part of the commercial community of British Burmah. It is not a document of much lucidity or intelligence, and does not at all diminish our desire to see Captain Sladen's own Report.*

Expedition of Mr. T. T. Cooper.—A persevering and intrepid explorer, Mr. T. T. Cooper, made an attempt, early in the year 1868, to traverse the unknown region between the Chinese province Sze-chuen and Assam, but was turned back by the Chinese authorities at Bathang, after making a successful journey up the Yang-tze and Tai-tow-ho rivers, and through the frontier town of Tai-tsan-loo. In August, 1867, he communicated his plans to the Council, in a letter written at Shanghai before starting, and a letter of instructions was drawn up by a Committee called for the purpose; but unfortunately these instructions, together with a letter I wrote myself, did not reach China before he started on his journey. They have since been returned through the Post-office; and Mr. Cooper, to the present time, is probably unaware of the interest we have taken in his movements. We learn that after his compulsory return from Bathang, he endeavoured to cross to Burmah *via* Yunan, and, finding this also impracticable, has gone round to Calcutta with the resolute purpose of exploring the routes between India and Western China from the side of Assam. A letter from Calcutta states that it is Mr. Cooper's intention to proceed slowly and to make a long sojourn, if needful, among the interior tribes; ingratiating himself with the chiefs and people, remaining months with one tribe, and then moving forward a stage to the territory of the next. Once at Bathang, he says, there will be no further difficulty. Although not a scientific man, Mr. Cooper seems to have many of

* On this subject of communication with the South-Western, and now independent, Chinese Province of Yunan with Burmah, *via* Momein, I received some valuable information from Colonel Ripley, who has been for many years Political Resident in Burmah. I regret to say that the notes with which he furnished me, in the form of a commentary on the Mission of Dr. Williams, have been mislaid.

the necessary qualifications for a traveller, in difficult regions like that he is now attempting to penetrate. The Calcutta merchants have raised a subscription to pay his expenses.

French Exploration of the Great Cambodia River, and of Yunnan.—

It is but recently that distinct information regarding this remarkable journey has come before me,* and I gladly take the opportunity of doing some justice to one of the most remarkable and successful exploring expeditions of the nineteenth century. The one great cause of regret connected with this enterprise is that its indefatigable leader, Captain de la Grée, did not survive to carry to Europe the results of his labours and hardships.

The expedition was constituted, in 1866, under the order of the Imperial Minister of Marine, M. Chasseloup de Laubat. It was placed under the command of Captain Doudard de la Grée, of the Navy, with Lieut. Francis Garnier, of the same service, as second in command, Messrs. Joubert and Thorel as surgeons and observers in natural science, and two junior officers. They left Saigon 5th June, 1866.

The highest point previously fixed by the French on the Great Cambodia River was Cratieh, about 280 miles from the mouth, and standing in $12^{\circ} 28'$ of N. latitude, where the tide is still slightly felt. Beyond this a long succession of rapids was encountered, occurring in a scarcely inhabited region of splendid forest which separates Laos from Cambodia; and 125 miles above Cratieh actual cataracts, some 50 feet in height, were met with. These will be an absolute interruption to the continuous prosecution of steam navigation, even so far indeed difficult to maintain.

It is worthy of notice that these rapids and cataracts are specially mentioned in the old Dutch narrative of Gerard van Wusthof, the leader of the last expedition (so far as we know precisely) that ascended this river—a journey that took place more than two centuries ago (1641).

Above the cataracts the river narrows and deepens between mountains; the width being reduced at some points so low as 300 feet, whilst the depth attains as high a dimension.

Between Khemarat and Vienthang (the ancient capital of Laos, which was visited by the Dutch Envoy, and is called by them *Winkjan*) the Great River again flows through a plain country, but

* Contained in the 'Bulletin de la Société de Géographie,' 1869, p. 97 *et seq.*; and in the 'Revue Maritime et Coloniale,' Avril, 1869.

at the last point mountains are again entered, and in all probability continue to its remote source. At Luang Prabang the travellers met with pleasing memories, and visited the grave of our lamented correspondent Henri Mouhot; but the latitude assigned by him to places on the route thither prove to have been more than 1° in excess.

It proved impossible to prosecute the journey up the course of the Cambodia River beyond Xiang Hong, or Kiang Hung, as we are more used to call it; the terminus of Lieut. Macleod's remarkable journey in 1837. It is satisfactory to find that the latitude of Kiang Hung observed by the French party is in perfect agreement with Macleod's, allowance being made for a transfer of the exact situation of the town since his journey.

From Kiang Hung the travellers struck northward through Southern Yunnan, passing the much-talked-of Esmok, now deserted, and made their way through that *terra incognita* to the city of Yunnanfu, where they arrived 24th December, 1867, eighteen and a half months after leaving Saigon.

The Society is aware that, for some fourteen or fifteen years past, the Mahomedans, who have formed an important part of the population of Western Yunnan since an early date in the middle ages, have been in revolt against China, and have succeeded in establishing an independent state, under a certain Sultan Suleiman, with their capital at the old city of Talifu, itself a chief point in the great commercial route between Burmah and China. It was to the French party an object of high interest to reach Tali, both on account of its geographical position and its present political importance. But when they were at Yunnan the two parties were in open war, and direct passage from Yunnan city to Tali was out of the question. Their resolution, however, was not easily baffled. Leaving his chief, whose rapidly failing health incapacitated him for further exertion, under charge of one of the medical officers at Tongchuan, in northern Yunnan, Lieutenant Garnier turned the scene of active hostilities by a venturesome détour across the gorges of the Kinsha, or Upper Yangtze, and actually succeeded in penetrating to the Mahomedan capital. Though appearances at first were flattering, the party had to leave next day in circumstances of great peril, and their leader had the satisfaction of bringing them all back in safety to Tongchuan, where, however, they had the grief to find their gallant leader in his grave. This episode in the journey could not have been achieved without remarkable courage and address on the part of Lieutenant Garnier.

Carrying the leader's body with them, the party at length reached Suchenfu, on the navigable Yangtze; here their perils and fatigues were at an end, and they were able to embark on the river for Shanghai, which they reached on the 12th June, 1868.

No Asiatic journey for many years, that I know of, has traversed so great an amount of absolutely new country. We need not take much account of the scanty old Dutch narrative, already alluded to, nor of the missionaries of the Roman Church, who have long been familiar with remote corners of the Chinese empire, but whose familiarity has brought little to bear in augmenting the public store of geographical knowledge. The whole journey of the French explorers from the tides of the Mekong to Suchen, on the Yangtze, with the solitary exception of Kiang Hung, where they touched the terminus of Macleod's journey, may be regarded as on virgin soil. 6200 miles were travelled by the party between Cratieh and Shanghai, of which 2480 were accomplished on foot! Route-surveys have been made of 4176 miles of the journey, corrected by the determination of 58 points by astronomical observation. Much other knowledge has been accumulated in philology, antiquities, zoology, botany, and geology, and several hundred sketches have been brought away. The narrative of the journey and its results is under preparation by Lieutenant Garnier, and will be published by the Imperial Government on an important scale. This most remarkable exploration will, I trust, be rewarded at our next Anniversary by the award of a Gold Medal.

SOUTH AMERICA.—Our indefatigable Gold Medallist, Mr. Chandless, having been unsuccessful in his attempt to ascend the Beni, has turned his attention to other affluents of the Amazon, and has completed the examination of the River Jurua, which, rising in the dense forests on the left bank of the Ucayali, falls into the Amazon between the mouths of the Ucayali and Madeira. Mr. Chandless has done his work with his usual scientific accuracy, and has fixed upwards of sixty positions along the banks of the Jurua.

The Peruvian Government has lately been displaying much energy in the exploration of the magnificent fluvial highways which traverse the eastern half of the republic. A sort of deck has been formed at Yquitos on the Amazon, and a steamer has recently ascended the Ucayali and Santa Ana to within a short distance of the ancient city of Cuzco. Our Associate, Señor Raimondi, is pursuing his researches with unabated energy, and we have received another valuable communication from him since the date of my last

Address, on some of the tributaries of the Ucayali. Señor J. G. Nystrom has also been employed in Peru, during the spring of 1868, in exploring the unknown forest-covered region to the eastward of the Andes. He has penetrated into the *montaña* of Paucartambo, and it appears from his very able Report that he fixed several positions by means of meridian altitudes and lunar distances, and also took a series of carefully registered meteorological observations. This is the country that was explored by Mr. Markham in 1853, and it is satisfactory to find that the topographical details in the maps prepared by Mr. Markham and those of Señor Nystrom fairly agree. I am gratified to place on record that, when Mr. Markham made his observations in 1853, by meridian altitudes, and with sextant and artificial horizon, he was only twenty-two years old, and was quite single-handed, being accompanied by two Indians only. It is, indeed, creditable to him that, in a vast unknown forest-region, he should have been able to register so much topographical knowledge, and even to insert many more names in his little map than are to be found in that of Nystrom, who was accompanied by a strong body of soldiers and two educated South Americans. We have also received a new edition of the Atlas of the Republic of Peru by that enlightened philanthropist Don Mariano Felipe Paz Soldan, whose introduction of an improved system of constructing guols and of prison discipline has conferred a great blessing on his native land. His new atlas contains 44 maps, 28 plates, and 75 printed pages.

From Bolivia, as I am informed by Mr. Markham, we have notice of a voyage of so peculiarly adventurous and enterprising a character that I cannot pass it without notice. Last year a Bolivian gentleman named Rada conceived the idea of collecting chinchona bark on the slopes of the Andes, and, instead of consigning it to some agents in a port of the Pacific, of taking it himself to England by descending the rivers Mamoré and Madeira. This was in itself almost a voyage of discovery. He embarked his valuable cargo in canoes, and, accompanied by his young wife, descended to the mouth of the Amazon, arrived safely at Liverpool, and, I am glad to be able to add, realised a handsome profit. The River Amazon has been remarkable for the adventures of fair ladies. The fate of Inez de Atienza is one of the wildest and most thrilling tales in the history of Spanish conquest in America. Madame Godin's voyage alone in quest of her husband, who was one of the members of Condamine's French expedition, is equally romantic. And now we have a third Amazonian heroine, in the person of this brave young Bolivian lady.

From Brazil we have received several valuable and well-executed maps, amongst which I may specially mention an Atlas of the Empire by Dr. Candido Mendes de Almeida, who has, in consideration of this important geographical work, been elected a Honorary Corresponding Member of our Society. Our Medallist, Captain Burton, who, since his residence as Her Majesty's Consul at Santos, has lost none of the zeal for geographical science which he displayed so signally in former years in Africa, has also given to the public the detailed and curious results of his Brazilian explorations since the date of my last Address.

At Buenos Ayres, Don Saturnino Salas, the Head of the Topographical Department in the Argentine Republic, continues his valuable labours, and we have this year received from him an excellent plan of the city of Buenos Ayres on four sheets.

THE FORMER AND PRESENT PHYSICAL CHANGES OF THE SURFACE OF THE EARTH COMPARED.—Towards the conclusion of my last Address, I called attention briefly to the dependence of geography on geology, or what was then termed the "oldest comparative geography." It was then shown, that many of those ancient features were absolutely dependent on subterranean movements, which from the earliest periods had been chiefly concerned in bringing about the broad outlines of the earth. I then endeavoured to carry the mind's eye back to ages long anterior to the creation of man, and pointed to the various changes which the surface had undergone before the earlier rude contours of land and water were established, to be brought, at subsequent periods, into their present forms by denudation, both sub-aqueous and sub-aërial, as well as by the wear and tear of centuries. I farther showed that, during the incalculably long eras when the various sedimentary strata constituting the largest portion of the crust of the globe were accumulating, abrupt changes of form took place at intervals, whether due to shrinkage or contraction of the outer crust, or to the expansion of internal heat and gases, which produced great breaks and foldings in the various outer layers of the earth. These phenomena, I argued, were sufficiently attested by the enormous dislocations of its crust, which have taken place in many parts of the globe. As I then inferred that there are regions where some of the prominent features, as determined in primeval days, are still maintained (though doubtless since much modified by the diurnal atmospheric action), so I now wish to proceed somewhat further in explaining how, in my opinion, some of the most recent of these grand geological pheno-

ness, which severed into separate fragments great masses of land, and have, in fact, made our country into its present insular condition, were among the greatest of all these changes.

No one fact has been better established by geological research than that after the close of all the great submarine accumulations of Primary, Secondary, and Tertiary age (with intercalated masses of fluviatile and terrestrial origin), the various formations, which had been elevated at some periods into dry lands, and depressed at others under the waters, at length were raised into great continental masses, which were eventually tenanted by races of numerous terrestrial quadrupeds and other animals, congeneric but not identical with those now existing. The period when a variety of such animals as the elephantine mammoth, the lion, the bison, the bear, the hyena, and herds of extinct oxen ranged over northern Europe, before England was separated from the continent, is attested by the abundant relics of such animals, which could only have migrated from a common centre when our islands were united as parts of the *terra firma* of France and the adjacent countries, where such fossil *reliquiæ* are found. Knowing, then, that the separation of England from France, as well as that of Ireland from Great Britain, was effected after the migration of these ancient quadrupeds, I am confirmed in the belief by the evidences which geological inquiry has recently yielded, that some of the most powerful explosions of volcanic force of which we have evidence also took place in the very latest tertiary periods. For example, the discoveries of the Duke of Argyll, Mr. Geikie, and others, which have shown that the outpouring of the enormous basaltic and other volcanic rocks of the Hebrides and the north of Ireland took place after the Miocene tertiary period, and buried under their *coulées* the plants of that epoch, affords the strongest indication of the sudden nature of the forces. These eruptions may well have been accompanied and followed by those disruptions which, separating England from France, formed the Straits of Dover, and let in the Irish Sea, in place of lands which formerly connected Ireland with England. Of this latter opening and depression, indeed, during pre-historic times, we have the most pregnant proofs in the fact that the Isle of Man, lying midway between the two countries, contains remains of the same gigantic elk, the *Cervus megaceros*, which so abounds at the bottom of many bogs of Ireland. For, as remains of this huge animal have also been found in Cheshire, the only reasonable inference we can

draw is, that the formation of the Irish Channel was caused by a great destruction and denudation of the *terra firma* which once united the two countries, when the great elk was the inhabitant of both. For on no reasonable hypothesis can it be even suggested that an original and separate creation of this huge elk took place in the little Isle of Man; still less can the idea be tolerated, that a herd of these unwieldy animals swam over a broad sea to the Isle of Man, if it be supposed that this spot had then been an island.

Again, the separation of England from France by a great geological break between those two countries after they had been one *terra firma*, is quite in accordance with the character of the abrupt cliffs on either side of the Channel, as well as with their composition and fossil contents. So in the Irish Channel we see that the headlands of Bray, near Dublin, and those of North Wales must once have formed a continuous whole.

Certain writers of eminence, indeed, who strive hard to account for all the diversities in the outlines of the earth by causes of no greater intensity than those which prevail at the present day, maintain that, if time enough only be granted, the seas and rivers, now actually flowing, combined with atmospheric influences, may have done all the necessary work of abrasion, to account for such breaks and cavities.

These authors opine that the long-continued action of water, as we now see it act, whether by seas or rivers, would account for the sweeping away of all debris from rocks which are now bare and smooth. They also explain the formation of vast subterranean caverns by the long-continued erosion of the limestone or other rocks by rivulets which once flowed in them.

I will offer some other reasons for dissenting from this view. First, let us revert to the broken and abrupt cliffs which face each other on the opposite sides of great marine channels, or those in the hard mountain limestone which forms the gorge of the Avon at Clifton, near Bristol and countless other river-gorges; how shall we explain these precipices by gradual wearing away? If the operation had been gradual, instead of the coast cliffs presenting proofs of dislocation and fracture, as they do, we ought, on the contrary, to find sloping dunes in their places!

Again, the western sides of the Welsh mountains tell the tale of prodigious elevations, by which sea-shells of modern Arctic species have been heaved up to heights of 1600 feet above the sea. In that tract (Mont Tryfan) we have the correlation established of a great

upheaval of the sea-bottom into high lands, in juxtaposition to an adjacent deep sea, each dependent upon a fracture and great oscillation of the crust, followed of necessity, as I say, by intense denudation, through the power of huge waves.

My hearers who may be inclined to believe that if a sufficient lapse of time be granted, much of the result may be explained by the gradual erosion of ages, will be pleased to recollect that the enormous depressions and denudations I am alluding to have been formed, as I have shown, since the great quadrupeds, now extinct, travelled over all these lands, and before they were broken up and disunited, and therefore these great solutions of continuity occurred in what may be considered one of the last units in geological time. This reflection, coupled with manifold proofs of rupture, as contrasted with long erosion, seem to me to lead irresistibly to the conclusion that, not long before, and possibly even after the creation of the human species, there took place some of those greatest disruptions of the crust of the globe, of which its surface presents innumerable physical records.

I must here take the opportunity afforded me, perchance for the last time, of saying to geographers a few words on the subject of denudation; which is, indeed, a subject well worthy of their consideration.

Some geologists have, indeed, of late years appealed to ordinary diurnal erosion in a most liberal manner to account for many of the leading features of the surface of lands, whether in the excavation of valleys or the sweeping away of all detritus from plains and hills. But if we merely interrogate existing nature, and mark the enormous difference between an occasional modern catastrophe and the ordinary action of the ocean or the atmosphere, we must, I think, admit that the clean-sweeping denudation by the grand waves which must necessarily have followed every great terrestrial movement in geological times, is fair and reasonable geological reasoning. Agreeing, as I do, with the main doctrine of the Huttonian theory, so admirably illustrated by Lyell, that denudation is essentially the removal of solid matter by water in motion, and that it has performed enormous works, I deem it to be essential to the right estimate of such power not to restrict the erosions which took place, in past geological times, to the ordinary action of the waves and currents of the sea and rivers. For, granting that the results of the present riverine and atmospheric action, as measured by the detritus carried down by great rivers to the sea, must, in certain

countries where the rocks are soft or incoherent, eventually carry away such lands, as in the region watered by the Mississippi, no such forces, if continued for countless ages, will account for the complete denudation and clean sweeping which has taken place in innumerable plateaus, deep valleys and gorges of hard rocks. Still less will any ordinary currents of the sea transport blocks of rocks from one tract to another. Yet this, as geological evidence teaches us, has often occurred in periods when, and in localities where, no ice-bearing agency can have acted. In short, it is a well-ascertained fact that deep sea-currents exert no transporting agency whatever, and that the smallest fragments only of sand, mud, and shells, remain at the bottom of such deep seas, and lie in an unruffled state. It is the action of wave-breakers alone that abrades coast-cliffs; and if such lands had not presented cliffs to the waves, no serious wearing away of them would occur. Hence it follows, that in order that the ocean should have power essentially to reduce continents or islands, these masses must have been first broken up through internal forces in such a fashion as to present precipitous escarpments on which waves could act.

Admitting, then, that dislocations produced such cliffs in former geological periods, we have, it appears to me, a "*vera causa*," which sustains the inference that such movements were accompanied by intensely powerful aqueous denudations. Let us then compare such convulsive changes as have been brought about in historic times (and recently, indeed, in startling activity), with those which must have been produced by the much larger bodies of water which were set in motion, when great upheavals of sea-bottoms and lands took place in geological times. Look to that which is or has been effected by ordinary currents of the ocean or waves in our day, and compare the results with the effects produced by a *single wave of translation*, when set in motion by an earthquake. Thus, we know that the recent small movements of the crust of the earth, of only a few feet upwards, which occurred on the coast of Peru, heaved back the sea for a few minutes! and then look at the stupendous effects produced by that one returning wave resulting from so slight an oscillation of land, when backed by the whole pressure of an ocean. Did it not instantly destroy a fine city, and, scouring the shore, transport a ship and hurl blocks of stone far inland?

To us dwellers on the earth this was truly a catastrophe. But, let my brother geographers go back with me into former, and not

very distant, geological times, when the proofs of the sudden upheaval of coasts and sea-bottoms are to be seen in the effects of those great vertical heaves which threw up masses of sea-pebbles and shells into clean-cut and separate terraces at different heights. For, each of these terraces—as seen around many parts of our islands, on the coasts of Europe and America, and particularly on the flanks of the great lakes of America and Asia—affords to my mind the clearest evidence of great upheavals.

As these terraces of sands, gravel, and shells, separated often from each other by hundreds of feet, are convincing proofs of sudden upheavals of vast magnitude, so it follows, that the bodies of water which were propelled on each of these occasions must have produced denudation and dislocation a thousandfold more grand than those of which the wave of South America or of any existing volcanic and earthquake region has afforded evidence in our days.

In short, it is quite conceivable that the renewal of any one of the great upheavals of former periods would not only sweep away most of the inhabitants of our continents, but would deepen our valleys by laying bare the rocks, which are now covered with various loose deposits, and all this without involving that long lapse of time which, with some modern writers, is the sole specific employed to account for and explain away all former changes of the surface of the globe.

No geologist, past or present, is more ready than myself to avow that the growth and increment of the former great accumulations of detrital matter call for and demand incalculably long periods, during which the successive races of animals and plants came into being, perished, and were followed by other races. But, though never parsimonious of time to account for the stupendously long history of succession, I am equally convinced, from the nature of the contortions, fractures, and dislocations of the crust of the earth, that these must have been accompanied by diluvial and transporting waves of incomparably greater power of translation, and consequently of denudation, than any force which man has ever witnessed.

I dwell with emphasis on these phenomena of former physical changes, as compared with those with which modern geographers are acquainted, because from this comparison we may reasonably infer that if an earthquake and oscillation of the land of our period can produce such wondrous effects by one wave, as on the Peruvian coast during the last year, the effect of the infinitely

grander waves of translation, which must often have been put into play during the former gigantic oscillations of the crust, must well have cleared the hills and valleys of all those broken materials which were left there by the sudden upheavals of former times; * whilst no ordinary diurnal atmospheric action, and no currents of the sea as they now act, could have produced such remarkable results.

CONCLUSION.—This Address has reached much larger dimensions than I intended, and has, I fear, fatigued many of you who have honoured me by sitting through this meeting. My apology is, however, that I have endeavoured to show you that my duties have been performed, by laying before you as clear a view as I can of the progress of geographical research in various countries, whilst I trust that in all previous sessions I have kept you well together in the bonds of continuous good feeling.

The ballot having terminated before I conclude this Address, I find that I am once more placed at your head for the usual official period of two years, and I have, therefore, to thank you heartily for this proof of your confidence in your old President. But the duration of my health and life during such a term is not to be relied upon, and if at the end of the first of these two years I should find that I am incapacitated to serve you with the same zeal as heretofore, you will, I am sure, permit me to retire with your thanks for my devotion to your cause. In truth, I had resolved to cease to hold office at this anniversary, but when the Council unanimously urged me to remain at my post, and declared that I must be found in this Chair at a time when it may be expected that my dear friend Livingstone will return to this country, acquiescence on my part became a sacred duty: and so, gentlemen, I hope to live to see the ardent hopes of the British public realised, and to be able on my own part to preside for a second time over a grand national Livingstone banquet.

Lastly, Gentlemen, it affords me the highest gratification to inform you, that our Vice-Patron the Prince of Wales signified to me, whilst these sheets were passing through the press, that he would attend the Anniversary Dinner of this day. The words in the letter addressed to me evince such a true geographical

* For a much more expanded view of this subject, see the last chapter of the 4th edition of 'Siluria,' p. 499 *et seq.* Also Hopkins on the 'Elevation and Denudation of the Weald of Sussex,' and Whewell on the 'Powers of Waves of Translation,' as given in the 1st edition of the 'Silurian System,' p. 338.

spirit, that I transcribe them as a most encouraging and satisfactory conclusion to this Address.

"I can assure you (writes His Royal Highness) that nothing will interest me more, or give me greater pleasure, than attending this Dinner at which you preside. My only regret will be, that our mutual friend, Sir Samuel Baker, will not be present. I have taken great interest in the grand project of the exploration of Equatorial Africa, which is to be effected under his guidance, and I heartily wish him all success."

This language of the Heir Apparent may well be recorded in our Volumes, as our eminent Medallist, Sir Samuel Baker, himself has told me that it was mainly through the active personal exertions of the Prince of Wales, that the Viceroy of Egypt was led to carry out in a munificent manner this great and laudable undertaking.

POSTSCRIPT.—*Discovery of the true Mouth of the Limpopo or Benue River.*—I am able to add, as my Address is being finally printed off, that the great desideratum in South African geography, to which I adverted in a former Address, has been at length accomplished through the meritorious exertions of Mr. St. Vincent Erskine, a son of the Colonial Secretary of Natal, the Hon. D. Erskine. The great distances traversed on foot by this adventurous and undaunted young explorer, the resolution with which he overcame the most serious difficulties and dangers, the numerous astronomical and physical observations which he made, and the excellent map he has constructed, of the vast region extending from the north of Natal to the Limpopo, combine to render this communication one of the deepest interest. The subject will be brought before the Royal Geographical Society on the 14th June.

1st June, 1869.

PROCEEDINGS
OF
THE ROYAL GEOGRAPHICAL SOCIETY.

[ISSUED NOVEMBER 8TH, 1869.]

SESSION 1868-69.

Fourteenth Meeting, June 14th, 1869.

SIR RODERICK I. MURCHISON, BART., F.R.S., PRESIDENT, in
the Chair.

ELECTIONS.—*Robert E. Davies, Esq., J.V.; Edward Durham, Esq.; John Orr Ewing, Esq.; Captain Richard Vesey Hamilton, R.N.*

ACCESSIONS TO THE LIBRARY FROM 24TH MAY TO 14TH JUNE, 1869.—
‘Overland Railroad through British North America.’ By A. Waddington. 1869. Donor, the author. ‘*Sur les Voyages et les Travaux de M. le Comte S. d’Escayrac de Lauture.*’ Par Malte-Brun. Donor, the author. ‘*Travels in Central Caucasus and Bashan.*’ &c. By D. W. Freshfield. 1869. Donor, the author. ‘*State Emigration.*’ By E. Jenkins. Donor, the author. ‘*Route from the Atlantic to the Pacific, through British Territory.*’ By Sir H. Verney. Donor, the author. ‘*Voyage à travers l’Amérique du Sud.*’ Par Paul Marcey. Paris, 1869. Purchased. ‘*Voyage aux Pyrénées.*’ Par H. Taine. Paris, 1860. Purchased. ‘*General Report of the Great Trigonometrical Survey of India during 1867-68.*’ By J. T. Walker, R.N.

ACCESSIONS TO THE MAP-ROOM SINCE THE LAST MEETING OF MAY 10TH, 1869.—Historical Wall-map of Prussia, showing the Acquisitions since the year 1814. By Dr. Breecher. On 8 sheets. Purchased. Geological Map of Sweden. 5 sheets of ditto. Presented by the Geological Society of Sweden, through Professor A. Erdmann. A Descriptive Hand-Atlas of the World. By J. Bartholemew, F.R.G.S. Parts 1, 2, 3, 4, containing 8 maps, with letter-press. Presented by Messrs. Fullarton and Co. A General Atlas of America, with two

maps. By A. G. Kohl; and a Wall-map of Palestine. By C. Hergt. Both presented by Sir R. I. Murchison, K.C.B., President. A Map of the Railways in and around London. By M. Vigers. Purchased. A Map of the North-Polar Basin, showing the track of Whalers, from the year 1777. By A. Petermann. A Map of the Arctic Regions, between Spitzbergen and Greenland, showing the tracks of the whale-ships from the year 1671 to 1868. By A. Petermann. A Map of a portion of Eastern Turkestan, showing the route of Ssewerzow and Osten-Sacken in 1867, from Issyk-Kul to Kaschgar. By A. Petermann.

Dr. R. J. MASS read the following paper:—

Journal of an Excursion to the Mouth of the Limpopo. By
ST. VINCENT ESKINE.

(Abstract.)*

MR. ESKINE states, at the commencement of his journal, that he heard of Herr Mauch's proposal to penetrate Africa from south to north, when engaged on service some hundred miles from Pietermaritzburg, the capital of the colony. He forthwith determined to employ eighteen months' leave of absence in an attempt to explore the course of the Sabia and Limpopo rivers, and offered himself to Carl Mauch as a companion upon his northward start. He left Pietermaritzburg, to carry out this purpose, on the 6th of May, 1868, and crossed the Drakenbergen, and the Vilge and Orange rivers in a transport wagon, to which he had attached himself. In this conveyance he reached Potchefstroom, the most important town of the Transvaal Republic, after some days of slow travelling, and then found his way thence to Pretoria, by another trading wagon. He remained at Pretoria, the guest of Mr. Lys, a well-known English merchant of the place, for three weeks, and then passed on to Leydenburg, a distance of about 100 miles, with Mr. Lys, in one of his wagons. He remained at Leydenburg, at the residence of Mr. M'Laughlan, for about a week, in consultation with Herr Mauch, and employed a portion of his time in practising instrumental observations. He satisfactorily determined the longitude and latitude of Leydenburg as $31^{\circ} 30'$ E. longitude, and $25^{\circ} 4'$ S. latitude.

From Leydenburg Mr. Eskine travelled in two days and a half in one of Mr. M'Laughlan's wagons along the course of the Umchla-

* Prepared by Dr. Mass from Mr. Eskine's original journals in the possession of the Society.

singwana River to Trigaardt's Farm, in latitude $24^{\circ}02'$ S. He remained here until he could succeed in engaging eight Kaffirs, as bearers; and with these, and a native servant, Adam, who had come on with him from Natal, he again started on the 13th July, purposing first to make his way to Umzielas, the paramount chief of the Bembe or Limpopo country; this chieftain's ordinary residence being at the confluence of the Lipaluli and Limpopo rivers. In three days he reached the summit of the Drakenberg, and looked down upon a broad plain, with the Umchiasi River winding through it like a silver thread. He descended the mountains by a very broken fissure in immense red cliffs, and reached Imperani's kraal, or native village, the same evening. At this place he made his first acquaintance with the Knob-nosed Kaffirs, who pinch the skin of the face into a series of small knobs, about the size of peas, arranged in a line down the centre of the forehead and nose. The women adopt additional rows of knobs across the cheek-bones and the upper lip. Mr. Erskine states that these people have now associated themselves with the Manguge and Umzella tribes, and are becoming extinct as a distinct clan. At this place he also saw the first specimen of the dreaded Tsetse fly.

At Imperani's place he added another bearer to his retinue, and moved forward again on the 17th of July. His course now lay over a flat unvarying country covered with bush, with sandstone, conglomerate and quartz rock cropping out abundantly. On the Umtasiti River, a clear crystal stream, he found a beautiful white quartz reef, of the same description as those observed by Manch in the gold district of the Shashi River. Near to this spot he saw the first giraffe. The country now swarmed with game up to the Sorghabiti River. He noted the giraffe, eland, buffalo, koodoo, zebra, brindled gnu, bastard hartebeeste, and large and small bush-pig. He also remarked an altogether unknown species of large black pheasant, or Korm. Near the Sorghabiti River he shot a giraffe which measured 11 feet 3 inches from the tip of his tail to the point of his shoulder, and 16 feet 5 inches from the toe of his fore-foot to the top of his horns. His extreme length from tail to nose was 19 feet. As, however, he found by this experiment that it was extremely difficult to get his Kaffirs to move on from meat, and as he had neither time nor goods to waste, he determined to shoot as little as possible for the future. Some distance further on he found the channel of the Imbabati River, dried up into a series of small pools, and then entered a district of "open forest," consisting of large trees devoid of undergrowth. In latitude $23^{\circ}29'$ S. he came to Imbondune's kraal. This chief gave him some tchualla,

or native beer, and some dry meal, which made him exceedingly ill, and which he believes to have been in some degree poisonous. The chief forbade his people to sell food, and endeavoured to instigate Mr. Erskine's men to desert him. From this place Mr. Erskine communicated with a white trader on the Limpopo River,—Mr. Reeves,—by messenger, and received from him some supplies of flour, coffee, pepper, and dried vegetables. At Imbondune's kraal Mr. Erskine left his man Adam in charge of his goods, and proceeded alone for 40 miles, until he found three Kaffirs, who undertook to return for the baggage. The next day he sighted the Lipaluli River, bordered by highish ground, and in the evening bivouacked upon its banks in the midst of game. The following morning he crossed the stream, with the water up to his arm-pits, and at a spot where he estimated it to be 200 yards wide. The entire country now proved to be well cultivated and thickly inhabited. He soon reached a kraal, where he found it necessary to wait six days for the arrival of his bearers in charge of his baggage. When they came up he paid them off, as this was the limit of their engagement. On examining the baggage it appeared that Adam had abstracted some 25 lbs. of beads, most probably under the influence of the importunity and threats of the natives.

Mr. Erskine arranged with the chief of this kraal to accompany him on to Manjobo's place, some two and a-half days' distance down the river. As he could not start for four or five days, Mr. Erskine employed himself with observing, and had to read his instruments by the fitful glare of fires, kept fed during his work. He fixed the confluence of the rivers Lipaluli and Limpopo, however, with tolerable accuracy, in $23^{\circ} 34'$ s. latitude, and $33^{\circ} 40'$ e. longitude. The almost constant prevalence of cloud was a great obstacle. He could only get two reliable meridian altitudes. He records that the predominant winds had been either south-east or north-west. The mean of several observations for the temperature of the air gave 75° at nine in the morning, 77° to 82° at noon, and 88° at three o'clock in the afternoon. The temperature of the water, at the confluence of the rivers was 64° . His observations for the variation of the compass during the route gave α . 22° w., and γ . $22^{\circ} 30'$ w. He estimated these observations within thirty minutes of possible error.

Near the confluence of the river Mr. Erskine caught some remarkable fish, weighing each about 3 lbs., and measuring 18 inches in length. He also bought from the natives two kinds of fish, seemingly of the *Silurus Glanis*. The *Silurus Glanis*, and the ordinary "scale-fish" of Natal were abundant in the rivers. An exact and

detailed account of the unascertained species is appended to the journal.

Mr. Erekiné's narrative of his progress from the confluence of the rivers is given in the following words:—

"The chief at last presented himself, with men, and we started towards the middle of the day. After leaving the river some 4 miles away, we skirted along the lake called Lifugwee, about $1\frac{1}{2}$ mile long, and 1000 yards broad, fringed with reeds, but presenting a fine open sheet of water in the centre, frequented by sea-cows, alligators, and fish innumerable. I believe the path thus far trends towards Umzeilas's kraal, the paramount chief on the U'Sabia River; according to the natives, some fifteen days' walk northwards from this.

"We soon after regained the bank of the river, passed along it for some four or five miles, and, much to my disgust, had to stop at a kraal which is situated on a rise of about 150 feet above the river, and about 1000 yards from the bank. The surrounding country can be well surveyed from this slight elevation, and the Bembe seen meandering its way in the distance, until lost to view in the high trees along its banks, but by which from their brighter verdure it may be traced for some miles further. Next morning my men refused to go on, but, with persuasion, threats, and the influence of their chief, slight though it was, they were at last induced to start. The custom or law is to pay your bearers beforehand, so that you are completely at their mercy. That night, after a very hard walk, we arrived at Injobo's kraal, passing on the way through very thick bush.

"On our arrival I found a difficulty in getting food, but at last procured sufficient for that night. As usual, my blankets were put down under the nearest tree, of which two or three are generally left standing in each kraal, and I slept as only weary men can sleep.

"On awakening next morning, what was my dismay to find that all my bearers had deserted, leaving me still two days' journey from Manjobo's, the place agreed upon. I had paid these men my last salempore and large blue beads; the remainder of my goods being almost worthless, consisting of fine blankets and some 40 lbs. weight of small beads and files. I tried to hire men, but could not; and the owner of the kraal refused to take charge of my things, until, on my saying I would leave them whether or not, he agreed to keep them for a day or two, until I could hire men to return for them. Luckily my friend Macigimana had persuaded one man to stay, so that with the help of his two small sons, the man and my

own servant, I was enabled to carry my sextant, horizon, blanket, pot, and a few goods.

"That day we passed through a country where the bush began to get stunted and scattered, and slept at some kraals on the Benjane River, a small, stagnant stream about 20 miles in length, and after crossing this two or three times, the next day I saw its embouchure into the Bembe, and soon afterwards arrived at Umhamba's kraal.

"The chief, Macigamana, stayed at a kraal (Matomse's) on the road, and did all in his power to induce me to do likewise, but no persuasion would prevent my going on, so that although my servant almost refused to accompany me, until I used threats of dreadful violence, and notwithstanding that I could get no one to show me the way, I shouldered what goods I could, looked up Adam, and started; but after walking about two hours, I employed a man whom I met to carry some of my burden, and point out the road to Manjobo's, where we arrived about five o'clock, P.M.

"I went down to the river and had a delicious bathe, bought some boiled maize for supper, and went to bed. Next morning Macigamana sent to ask me to wait for him, as he was coming. I employed the interval in taking observations for longitude, and for variation of the compass, as the day was a superb one, with both sun and moon in view.

"About noon we started along the banks of the river, and after three hours' walk came to Manjobo's, passing on the way signs of old kraals, like "fairy rings," denoting the existence at one time of kraals at this spot, about half way between the two kraals of Umhamba and Manjobo. I afterwards ascertained that these kraals were formerly the residence of the late chief Shosongaan, father of Manicose, whose place is laid down in Hall's map, but incorrectly.

"Manjobo is the commander of the forces for this district. Umzeila the chief being afraid that his precious life might be forfeited by such close proximity (as 250 miles) to the Amaswazi, has removed himself some 16 days further off, and naturally his subjects here, at such a distance from the seat of Government, display all the characteristics of the savage, who is only kept under decent control by the immediate vicinity of a strong hand, and the fear of severe punishment.

"The history of Umzeila, is, perhaps, worth relating here. He is not the rightful heir to the throne; Maswerwa, his elder brother, having succeeded his father Shosongaan. After reigning some four or five years, the people got tired of the mild form of government he had adopted, of killing all the men unfit, from age or otherwise, for going to battle, and the young ones naturally thought, that

on his not finding any more old, he would begin on the young men, and as Umzeila had made one or two nearly successful attempts to dethrone Maswerwa, the nation invited him to accept the throne. After obstinate resistance on the part of Maswerwa, he was deposed, and fled to the Amaswazi tribe, who rendered him assistance on three different occasions to regain his throne. On the third attempt, so many of the allies perished from thirst and sickness, that the Amaswazi refused him any further aid, and soon afterwards he was obliged to fly, and now lives in the Amaswazi country resigned to his fate.

"Umzeila, on his brother assuming the chieftainship, had fled, to avoid the usual practice of putting to death those who may furnish a successor to, or claimant for, the throne, and conscience being a thing unknown in Kafirdom, hired himself to the Dutch, some say as a slave-hunter, but, I think, more likely as an ally, to do the 'dirty' work of sundry hunters and traders, when they suffered at the hands of surrounding tribes. Doubtless immense numbers of children and women were taken on these expeditions: the girls the Kaffirs retained, the boys and cattle going to their employers.

"By these means Umzeila trained and collected an army of some two thousand men, inured to war and hardship, and encouraged them in keeping up a harassing contest with their neighbours, thereby combining much profit to the Boers with amusement to themselves. Therefore, with the assistance of even a minority of the tribe, he could have succeeded in gaining the throne. Since then enmity between the two tribes has existed, the subjects of one not daring to intrude on the territory of the other, and the country on their boundaries is depopulated for about four days' walk. Umzeila, remembering the tricks of his former allies, is very suspicious of any thing or person connected with the South African Republic. Mr. Struben, having gone from Zoutpansberg to his kral to trade, was suspected of being a Dutch spy, and received such bad treatment that he lost all his goods, his donkeys died on the homeward journey for want of guides to point out water, and he perished some few weeks after his return, owing to exposure, hardship, and fever.

"On my arrival at Manjobo's, I heard that some white men were at the 'Amanzi Umhlopi,' or white water, and that they intended to come to the Bemba. After trying in vain for four days to persuade Manjobo to give me some men on hire to return for my things, I went back to find my friend Macigamana, and induce some men to accompany me to Injobo's—I found him at Matouse's kral. My servant Adam here complained of head-ache, and fearing

it was fever, I allowed him to remain, and went some thirty miles up the river, with four men, to Injobo's. On my arrival there I heard that the white people had reached the Bembe, and were some three hours' walk distant. Thinking it might be Mr. Sanderson, I determined to go to them. Having sent my things on, I started for Umlangani's kraal, where these men were, and on my arrival found them to be Messrs. Wood and Dubois Brothers, from Natal. I was most glad of this, as it went against the grain to have to share the discovery, which I felt certain that I should make, with any one, although I should have felt it my duty to do so. They kindly gave me the goods I wanted, and I started on my return. On my arrival at Matouse's, I found that Adam had not only paid the men double their allowance, but, as on the former occasion, had helped himself to goods, and spent them unnecessarily. As I had paid for his food during my absence, this was beyond human endurance; I therefore thrashed him, and he ran away. As I was obliged to be back at Umlangani's within nine days from starting, I could not wait, so gave directions that he should follow; and left alone, as I could not hire any bearers, the chiefs being adverse to my proceeding, I shouldered waterproof sheet, goods, ammunition, gun, pistol, sextant, &c., and some honey I had purchased, about 45 lbs. weight in all, and started for Manjobo's. In three hours I reached Umhamba's, where I rested, and after carrying this burden about two hours longer, I overtook a man proceeding in the same direction, who, for a consideration, consented to bear part of my load to Manjobo's, which I reached an hour afterwards. As my servant did not come with the goods deposited at Matouse's kraal that night, I started early next morning, leaving as much as possible behind; notwithstanding which I suppose I carried some 50 lbs. weight.

"The country here loses its thick, bushy appearance, becomes grassy and open, with here and there euphorbia, and a few vegetable-ivory trees, very similar in appearance to coconut trees; I walked all that day with only honey for food, and towards evening reached an immense bend in the river, extending north-easterly for about 6 miles: I therefore inquired the way to the sea, and was told that it crossed the river. On hailing one of the 'Dug-outs,' and after being kept waiting about four hours, I was condescendingly ferried across in this fearfully rickety machine, half full of water, for a few beads. I bought some sweet potatoes, and that night was taken to the petty chief living there to sleep. In passing along the river I was surprised at the countless number of crocodiles infesting it; on one little sandy island some fifty

feet in diameter, I counted no less than fifty large, besides numberless small ones, and on this account, although the river is fordable in some places, with water about 4 feet deep, canoes are used. About 4 miles further down is the limit of the tidal rise.

"Next morning I engaged a man to carry my things to the sea, making his chief a present, and paying him in advance, although on starting I did not feel much elated at having procured this assistance, for I noticed that the man omitted to take his rug with him, and, therefore, I might expect to be deserted at any moment. After proceeding about a mile or two he put the things down and asked for more payment, and on my refusal to comply with his request, left them on the ground and walked off. I put the best face I could on the matter, and shouldering the whole of the things went on, trying to dispel dull feelings and angry thoughts by whistling a tune, but am afraid it was a miserable failure.

"I trudged on that day, asking the natives I met, in the little broken Kaffir I could muster, if I was going right, and was generally answered, 'Yes; that the sea was three days' walk.' About two o'clock in the day I came to some very large kraals, which I was informed were the chiefs, that he was over the river, and that I must wait for the boat. I waited for some time, but whenever I approached a boat the ferryman immediately pushed off; therefore, seeing that I was to be detained that night on this side, I made an effort to continue my journey without crossing the river, but soon returned, as the natives insisted that the road to the sea was on the other side of the river.

"I had great difficulty in buying food, as my stock of goods was low, and the natives, as usual, profited by the occasion of a lone white man being in their power, not actually to rob by force, but to starve his goods out of him. I therefore contented myself with some sweet potatoes and a fowl.

"I held a grand consultation with all the councillors, and they agreed in stating that I should sleep four days on the road before I reached the sea; consequently, as I had only one ring of brass wire left with which to provide myself with food, I decided to return next morning.

"Here, as also at Manjobo's, the natives were surprised at my white face and hands: 'This is a white man,' they said; 'the Portuguese call themselves white, but they are red' (*imbemvu*). I told them my body was whiter than my face: 'Take off your clothes and shew us,' said they; but I told them that white men did not take off their clothes in public, but I would shew them my chest, at which they were much surprised and delighted,

and said my skin was 'very pretty.' I would infer from this that they had never seen a truly white man before, and that therefore the statements of certain Dutch Boers and hunters of visiting this country are not true; and that, with the exception of those natives who had been at Delagoa Bay and Inhambane, they had never seen a European before. They told me it was four days' walk to Delagoa Bay, or Umvuma, as they call it, at the mouth of the Umkomagazi River, the Umkomati of the Boers, and Manhissa or Manicose of the Portuguese. They have still another name for the river here, 'Meti,' which adds one more to the list, Linpopo, Kro-Kodil, Ouri, or Bembe; and, as my observations seem to point out that the Inhampura River's mouth is the outlet, therefore the list would be still further increased. In ancient geography the river is called 'Spirito Santo.'

"Next morning I started on my return, accompanied by two men, I suppose as guards, to prevent my dodging down the river, and accomplished the same journey down in one day which I had taken two for on a former occasion. Neither of these men would carry a single article for me. I was as poor as an 'Umfugazsan,' which is here a more heinous sin than it is in Europe. I was no 'inkosi;' I was not 'even a rich man; and could they, the King's messengers, be expected to carry things for an "Umfugazsan"?' This was the invariable reply when I asked them to relieve me of some of my load.

"Two days afterwards I got to my friends Wood and Dubois, with the intention of abandoning my purpose if one of them would not accompany me, as I found that I could not get on from want of bearers and my inability to speak 'Zulu,' the language of the country, and to the contempt and suspicion with which they regarded a white man carrying his own things in pursuit of an object which to them seemed so absurd. I heard from Wood that McLachlan and Ash, who had been so kind to me in Leydenberg, were about three hours' walk from the river, trading. As all the assistance they could give me had been rendered, they advised that I should see McLachlan and get his help. They said also that Robert Dubois, having gone to Manjobo's in consequence of the reports I had brought, would perhaps, from his great knowledge of the language, obtain some information upon which I could act. I therefore went over to McLachlan, and he advised me on no account to give up my object, thereby wasting the expense, trouble, and anxiety to which I had been put, and that he had ascertained that the sea was only five days' walk from where we were, and therefore not more than two from where I had turned back. He generously

allowed me to hire two of his men, and, as they did not know me, stood security for the (to them) handsome payment of five blankets each for the trip down and back. He gave me all the goods I wanted, and treated me with the generosity for which he is well known. Allow me here to record my thanks to him, and also to the two Dubois and poor Wood, whose death will be mentioned, for the kindness shewn to me by them.—

‘A friend in need is a friend indeed,
And few there be that find one.’

“I returned the next morning to Umlanjane’s, and heard from Mr. Edmund Dubois that Manjobo had sent to enquire of my whereabouts, and, on being told I was returning homewards, said ‘It is well.’ Dubois seemed to interpret this into a threat; but after consulting McLachlan, I determined to proceed.

“After a walk of about 70 miles, I reached Manjobo’s for the third time, and there found Messrs. Robert Dubois and Ash. I consulted with Dubois, and got him to interpret to Manjobo and explain the object of my journey; but he still refused his permission to my proceeding, and said that if I went it would be bad for me. Dubois asked what he meant. He said, ‘Oh! he will not be killed; but he will be lost, and you will hear no more of him.’ I continued my journey, notwithstanding.

“Near this kraal I saw a large herd of about thirty sea-cows. I would not shoot any, as the Kaffirs who had treated me so badly would have reaped the benefit. Dubois shot one, which came to the surface about 8 o’clock, two hours after being killed. He and some thirty Kaffirs and myself adjourned to the river. Dubois, having just recovered from fever, did not like going in, and until I led the way no Kaffirs would go and drag him out, for fear of alligators. After being shamed into it, some followed me.

“On leaving Manjobo’s the country is still open and thickly inhabited near the river, and on the few streams flowing into it. The soil is of the richest alluvial, and produces every variety of ‘native’ food, principally maize, sorghum, sweet potatoes, yams, sugar-cane, bananas, and several varieties of beans, as well as tobacco of a better growth, and more carefully cultivated than a great deal I have seen grown in Natal by Europeans. The leaves are enormously large and round, and they understand the practice of ‘nipping’ off the blossoms to give greater strength to the leaves, ‘hand-weed’ and hoe it continually.

“I think I omitted to mention that the sands of the river contain numbers of small white shells about as large as a ‘silver penny,’

of the cockle species, more numerous from Manjobo's to Siduda's than elsewhere: I have no idea whether these were fresh or salt-water shells, but from the uniform level of the country, and the fact that I saw somewhat similar shells beyond the limit of brackish water, I should judge that either the tide had at one time ascended further up the river, or that the sea covered this tract of country, and that these were marine shells.

"I also observed at Isingungatane's kraal, though in fresh water, a description of periwinkles on pieces of old timber and canoes.

"I much regret not having brought back some of the small 'cockle-shells;' but after having collected some, I threw them away, intending on my return journey to get a few, but owing to anxiety, starvation, exhaustion, and fever, my thoughts were more directed to the preservation of my life than to the evidences of geological formations.

"While I am on the geological subject, though no geologist myself, I think I may venture to state that the country is of recent formation, from the fact of the existence of the shells referred to being found at considerable depths below the surface, and from the existence of the sandstone that is found on the 'bluff' at Port Natal, on the sea-shore and at Umhamba's. I observed this stone generally presenting a flat surface, full of holes and depressions, and although hard, being rotten and porous.

"With reference to the appearance of the country higher up and along the course of the Lipaluli, or Oliphant's River, I think it may be referred to an older formation, as amygdaloid, quartzose rock, and iron-stone present themselves above the ground, more especially about the Sorghobiti River.

"I think at one time the ocean must have covered this country, from the generally sandy nature of the surface and the worn appearance of some of the rocks; but I also remarked that the ironstone had been little affected by anything, except what might be ascribed to atmospheric causes.

"To return to my weary journey, I arrived at Siduda's kraal about one o'clock in the day. He kept me waiting about one and a half hour before he condescended to appear. His first words were—'I am a chief, I am the great chief Siduda, a Bonguni (direct descendant from the "Zulus"), I speak only through presents (Harkerlê).' This was not a pleasant reception, and his subsequent conduct was in accordance with it.

"I gave him a present, and explained my object to the best of my ability, as neither of the men I got from MacLachlan could under-

stand English or much of my indifferent Zulu, as they were either of Mangages or Umgage's tribe.

"The chief himself spoke pure Zulu, which enabled me to understand and explain things after a fashion. I told him that Ash wanted to buy ivory, and that if he sent for him with a note from me he would come. He replied, 'Yes, that was a good proposition; that my two men must go with a note, and I must remain until they returned, and that he would send a messenger to Manjobo to see why I had no one from him.'

"Now, knowing that Manjobo was against my going on, I determined, at all hazards, to get to the sea before he could be communicated with, as I knew my fate if he once heard that I was determined to go on. I therefore replied that it was impossible, because if Ash came, I wished to shoot hippopotami (*Immbu*) with him, and I could not do so if I had to go to the sea then. Siduda insisted on his proposal; I at once started, but my two men refused to follow. I, therefore, was once again alone without bearers or instruments, and but few goods; but with a stout heart I set out. I was followed by about fifty natives, who poked sticks in my face and otherwise tried to hinder me: at last one caught hold of my gun, which was on my shoulder; I could not shorten my grip soon enough to deal a blow, as the 'swarm' was rapidly closing on me, I therefore drew my revolver, which I had before luckily explained to them, as having five men's lives at its disposal: on its appearance they left my gun and kept their distance and soon after left; but I had not proceeded far before I was again followed, and told that Siduda would give me a man to go to the sea if I would return. I therefore made them go in front, and did so. Luckily I kept a sharp eye on their movements, for as the path led through a fence of reeds, I observed them, through the chinks here and there, clustered and stooping behind it ready to pounce on me.

"Seeing this I passed through another opening some 10 yards behind them, and until I turned and laughed at them they were unaware of my whereabouts, but as intent as ever with their hands all ready for a pounce. They all came away like dogs with their tails between their legs, amidst the derisive shouts of the old men and councillors assembled under a tree hard by.

"I was requested to sit down amidst the throng, but I asked that all might sit in front of me, as I had already experienced their attentions: this was received with laughter. I was then shown the man who was to go with me; but, knowing their lying propensities, I scarcely looked at him, beyond seeing that he was a councillor, and therefore not likely to serve as a guide.

"My two men, who had in the mean time started homewards, were sent for, but only one returned, almost by force, and the other was considerably expedited in his retreat.

"I imagined that these men had been persuaded to run away, and that the one was made to return; I, therefore, told the chief that Ash would not come unless I wrote, and that the runaway would only be punished for his cowardly and treacherous conduct by his master. He therefore proposed that my servant should go, together with a messenger from him, and that I should be supplied with a man to go to the sea. I wrote the note, and next morning I went one way and my servant another; again being without anyone accountable for my safety.

"But little did I care, when the accomplishment of the object of my journey burst upon my view, through an opening between two sand hills, looking like caps of snow in the distance. Between those hills ran the Bombe River, and on the other side was its mouth.

"I felt capable of undergoing anything at that moment, forgetting the solitude, sickness, and despair I had suffered; forgetting that I was at the mercy of the savages, and that I had to walk 600 miles before I should again behold 'home, sweet home.'

"Those only who have suffered the same hardships can appreciate that yearning for civilised society, and the dread of passing again through the trials and dangers I had experienced.

"I slept at Isinfungatane's kraal, on the southern side of the river, and recrossed again next morning. After going along the bank and passing through part of the 'fen' I had waded through for four hours on the previous day, I crossed three small streams, left the immediate bank of the river, and began to ascend the Umshan-tshan hills, to avoid a large marsh which is impassable, and stretches from this point to the hills bordering the sea, and on each side of the river for about 5 miles.

"There is a great change of the country here—fine grassy hills dotted with clumps of bush and views of the sea-range in the distance, displaying the bare sand in places. The soil of these hills is red, and much like the soil of some of the coffee-land at Natal, on the coast. I observed in the valleys below small clear fresh-water lakes, and here and there a marsh, with papyrus-rush reaching its fine hairy head to a height of 10 feet, from stems as large as my arm.

"To the right was the marsh I was skirting, stretching for about 5 miles to the river, and beyond to some hills, under which flowed the Inculuzane River, which discharges itself into the Bombe,

within 3 miles of the sea. I ascended a rise, and the Kafir said, ('There is the sea,' Nantzi Lunnhla.) I then passed through thick bush which borders the coast, and arrived at the Indian Ocean.

"As it was only about 4.30 P.M., I wished to go at once along the beach to the mouth of the river, which I judged was about eight miles to the southwards, but my bearer and guide would not accompany me; I therefore told him to await my return, and started alone. I did not get along very fast, from the steepness of the beach, which left little hard sand. About 6 o'clock, seeing a path through the bush, I climbed up, hoping to obtain a view of the country, but found it only led to some temporary fishing-huts, and seeing evidences of habitation I determined to stop there for the night. I tried to penetrate further, but found it impossible from the density of the scrub. The Kafirs returned meanwhile with some water they had been to get at the lakes referred to, and also of shell-fish, which they had collected, consisting of 'sea-eggs,' mussels, and several other kinds. They gave me water, and in return I gave them some 'stamped' maize (u'parsula), and we three made our frugal supper off the shell-fish, roasted on the embers, and the maize, with 'Adam's ale,' which had been my drink for the last few months.

"Next morning, before sunrise, I got under weigh, and walked for nearly three hours without reaching the river, and, seeing some natives coming down to the beach in the distance, I beckoned them to approach. On their arrival I asked where the 'Bembe' was, and they said 'There,' pointing a mile or so on. I certainly saw a faint black line; but was so convinced that this river could not enter the sea in so insignificant a manner that I employed one to show it to me. He went about 500 yards into a small rise of sand amidst the surrounding waste, and pointed out the lagoon and mouth of the river, which was now plainly before me. He then turned back and left. A few moments after, I stood gazing on the long-sought mouth of the Limpopo or Bembe River. The thought crossed me, Is it worth while to have gone through so much to get so little?

"A stream of about 300 yards wide (at full tide) flowed into the ocean; and, although it was not rough inshore, I noticed the sea breaking some 3 miles out, not in one roller, as on a bar, but in a succession of small breakers, until it reached the shore; thereby, I think, demonstrating that though no marked sand-bar existed, there was great shallowness of water outwards for about 3 miles. Whether or not channels exist through this sand, I am unable to judge, having had no means of ascertaining the fact.

"I waited until noon for observations. As the horizon was obscured to the northwards by land, and, as already mentioned, the loss of my mercury prevented me from using an artificial one, I was obliged to take a back observation for latitude, and prevented altogether from taking the longitude.

"As the coast-line has been pretty accurately laid down by abler hands than mine, and with better appliances than I could have used, I do not much regret my being prevented from taking a longitude; and having settled satisfactorily the latitude by a 'reduction to the meridian' and a 'meridian altitude,' it will only be necessary to state that the mouth of the Limpopo River is situated on the eastern coast of Africa, in latitude $25^{\circ} 15' 09''$ S., as determined by a meridian altitude, or by a reduction to the meridian (an approximate method), $25^{\circ} 15' 29''$ S., and about the 34th parallel of east longitude. The shore on the northern side of the river is a flat of loose sand, evidently overflowed by the river occasionally in summer, and perhaps by the sea at spring-tides. More to the north, up the coast, high sand-dunes, in some places clothed with scrub almost to the summit, and in others in their naked dreariness, appear. The sandy ridges and bare patches give the appearance of snow when seen at a distance inland. There is a lagoon about one mile wide and five miles long, and a channel about 100 yards long connects it with the ocean.

"I bathed in the mouth of the river, but on account of alligators and the feeling that if I was lost no account could be given of my expedition, as I was alone, prevented me from going further than where the water reached my chin. This was about 20 yards from the shore, and at that point there was evidently a deep channel, as the bottom shelved so sharply that I could hardly stand. This was at low tide. Before I left the tide ebbed, and I much regret not being able to see the place at high-water.

"I retraced my steps, and found my man awaiting me. I slept on the shore that night, and made Isingfogatane's kraal next day. This kraal being on the southern side of the river, I was obliged to cross; and, as it was raining, no Kaffirs could be seen outside their huts, neither could they be brought to the river by shouting. I therefore told the bearer to swim across for the boat, but he refused, and said, 'There are alligators who bite men.' I then jumped in and swam across, as it would have been certain death to have remained in wet things all night. I found the river far out of my depth from bank to bank, and until then was unaware of the weak state I was in. I could hardly reach the opposite shore, though the distance was only about 300 yards. My clothes were half-dried

during the night, and I reached Siduda's next day. Here I found my servant, who had been with the messenger with the note for Ash. He had returned before my messenger got to Manjobo's, and therefore he had not seen him."

Mr. Erskine now commenced his return. His first rest was at a kraal three hours' walk up the river, at a spot marked as the highest point of the stream reached by the tide. He here purchased a single meal for a blue handkerchief, and then travelled on, with the severe headache indicating incipient fever, to Umlangane's kraal, a distance of 140 miles, which he accomplished in nine days, having walked eleven hours at a stretch on two successive days. He found that McLachlan and Dubois had left the place, the former going to the south-west, and having the large gun, clothes, and artificial horizon with him. Dubois had gone to the south-east, and had left messages that whatever was promised along the route in his name should be certainly paid. Mr. Erskine therefore followed in his track. He stayed a day at Umlangane's kraal, and on the third day overtook Dubois's party at Umchahela's kraal. Both the Dubois were here prostrate with fever, and incapable of the slightest exertion. Five Kaffirs were in the same condition. One of the Dubois was also suffering injuries inflicted by the charge of a buffalo. The four helpless men remained in this pestilential spot a week, and then managed to crawl on painfully 4 miles. On the next day they made 6 miles, and reached some knaals, where they rested four days. They then travelled 20 miles in two days, and again halted at knaals five days. During this halt Mr. Erskine made his first and last lion hunt, which must be described in his own words:—

"Moved by the report that two or three lions had been seen, and that one was not far off, I shouldered my gun, and was joined by a host of Kaffirs, who made such a noise that few lions would have faced them. The clamour, however, grew by degrees small and beautifully less the nearer we approached to the king of beasts, and on arriving within 500 yards the Kaffirs drew up in line and I at last got to the front, which I had been prevented from accomplishing before from my inability to keep pace with them. I had not advanced more than 20 yards when an animal, about the size of a foxhound, sprang up and made off, tail on end, in a dire funk and at a pace which defied pursuit. And this was a 'live lion!' Ill as I was, I threw myself on the ground convulsed with laughter, and shouted to the Kaffirs to 'Catch him alive, O!' They set up a yell, which lent wings to his flight and made him whine with fear."

From this spot the party skirted the eastern side of the Bomba Hills, and in 15 miles reached the Sabia River. They encamped under a large tree on the banks of the river, all the party being extremely weak, although relieved from the paroxysm of fever, and Wood being seriously ill; he sank rapidly in this place, and was buried under a large tree. The survivors were now attacked with dysentery, and had to move on, in most wretched plight, in heavy rains. At the Umgwema River they found temporary shelter in some deserted huts. The Umgwema River joins the Umkomasi on the western side of the Bomba Hills. The Sabia joins the Umkomasi on the eastern side of the hills, itself running through the range. The conjoined Umgwema and Umkomasi pass through the hills at their junction. Another river, the Umlumazi, falls into the Umkomasi a little further to the south. In the absence of the artificial horizon, Mr. Erskine tried several devices in attempting to fix the latitude of these rivers, but failed entirely in consequence of the prevalence of strong wind. From this spot the faint blue outline of the Drakenbergen was visible towards the west. After a short march the party reached the Umlumazi River, and bagged three hippopotami. The stream was infested with crocodiles, which made off with the carcasses of the slaughtered sea-cows in the night. The rain was here almost incessant. The next day the party reached the first kraals of the Amaswazi tribe; the country between this and the Sabia being depopulated in consequence of the state of war existing between the Amaswazi and the Umzeila. It was now forty-five days since the party had tasted farinaceous food, and they were rejoiced at procuring some millet-meal. The inhabitants of these kraals were without cattle. After two days' further march, Edmund Dubois broke down entirely, and had to be carried some distance by his brother, Mr. Erskine, and two Kaffirs. Mr. Erskine writes at this time, "I shall never forget the weight of a quarter of a man, which was my share of the burden. I was so weak that I could not carry my gun, and in fact was so ill that I hardly know whether I should be able to go on the next day. It was, therefore, not surprising that an additional weight of 40 lbs., and that of a man so weak that he could not stiffen himself to allow of his being carried with ease, should have caused the perspiration to pour from our already reeking bodies, and should have left a sensation of horror in the memory which will not be easily effaced."

Six miserable days were spent at the next resting-place, an Amaswazi kraal, the food consisting of guinea-fowls. The wagon was now four days' walk a-head, and two natives were sent on to it. The Umkomogazi River flows fast past the kraal. The next

day's journey carried the party to Mahorbo's kraal, where Robert Dubois pushed on a-head towards the wagons, to send back supplies to his more exhausted companions. After crossing the Umvolosini river the wagon was reached; but the rats had eaten all the remainder of the flour, and had destroyed most of the stores, and the clothes were filled with bugs. There was plenty of milk, but this was for the present a forbidden luxury. They now, fortunately, had an abundant supply of the most important medicines. The journey from the Bembe River to this place had occupied thirty-seven days. Mr. Erskine again failed entirely here to get any reliable observations, on account of the prevalence of strong winds. He records that throughout the journey the wind was almost always blowing strongly from the north-west in the morning, and from the south-east in the evening.

The White Umvolosini, and the Little and Great Usutu, the Ingwempisi, and the Umkonto, which unite on the western side of the Bomba Hills to form the Usutu River, were now crossed in succession; and then the Pongolo, the Ingwavuma being left to the west.

The country drained by these rivers is claimed by the South African Republic, and is well watered and healthy, excepting a tract within 30 miles of the Bomba Hills, which is flat, bush-covered, invested with the Tsetse-fly, abundantly supplied with game, but unhealthy.

The Bomba Hills are composed of sandstone, with blocks of blue granite or whinstone on the top. They are inhabited along the summits; but the eastern side of the hills is marshy and unhealthy. On the western side of the range the Ingwavuma River joins the Pongolo, which then runs on into the Usutu, to form what is incorrectly called the Mapoota River, a stream emptying itself into the southern side of Delagoa Bay.

Mr. Erskine now suffered from liver disorder, consequent upon the fever, and became exceedingly weak. He made his way gradually on over the Buvaan River, the head-waters of the Umvolosini, and then happily crossed the Buffalo River into Natal territory.

Mr. Erskine thus concludes his simple narrative of bold and brave adventure:—

"The result of my examination of the country to the north and north-east of Natal, is the certainty that in that tract, many times larger than England, there are districts fertile and healthy for man and beast, which can at present hardly be said to be inhabited. The fly would, in all probability, disappear before civilised occupation, and with the game. There are no native tribes which

would seriously oppose the gradual occupation of the land by white men. The country could be reached with facility from Delagoa Bay, or by the Inhambane, and is certainly healthy to within 150 miles of the coast. The Delagoa Bay route is, at the present time, in process of survey, for the Glasgow and South African Company, by my brother Townsend, with a view to opening out their lands situated on the eastern borders of the Amaswazi country. It is most desirable that the territory between the Limpopo and Sabia rivers should be explored, and the Sabia may be navigable. This is the district described by old geographers as Sofala, or Ophiir, and Monomotapa—rich in gold.

"Ill news flies apace. Some officious person from the northern frontier rode into Maritzburg, with the intelligence that I had been picked up by a Boer, lying in my blanket in the veldt beyond Zoutpansberg, nearly dead; and my father was about to start in search of me when I walked into his room. He did not recognise me at first. All, however, is well that ends well. I should be entirely willing, notwithstanding all my privations and distress, again to undertake a similar trip; but I would never do so unless properly equipped. I made two grand mistakes, which should be avoided on another occasion. The first was the going without sufficient goods; the second, the travelling in the character of an explorer, rather than in that of a trader. Had I gone in the latter form, I should have had no trouble at all with the natives. My one great advantage was that I was well supplied with medicines. Without these we should possibly all have remained with poor Wood—who, perhaps, after all, has the best of it. My younger brother is so far from being discouraged by my adventures, that he is eager to start at once in my footsteps upon a sporting trip, taking with him as besets of burden only donkeys, which certainly would prove the best animals a man could have on the Limpopo. I am now a sleek Treasury Clerk, again paying more attention to tare and tret than to latitude and longitude. But, as with Sinbad the Sailor and Robinson Crusoe of happy memory, the spirit of wandering is only laid, not exorcised; and at the call of science I would again place my services, such as they are, at the disposal of the Royal Geographical Society, at whose instigation I undertook the exploration of the Limpopo, Bumba, or Spirito Santo River, thus far virtually accomplished."

Mr. Erskine's Journal will be published entire, with his Map, in the 'Journal,' vol. xxxix.

The President, in returning the thanks of the Society for this important communication, and to Dr. Mann for having prepared it for reading, said that

the Council had that day agreed to bear a portion of the expenses incurred by Mr. Erskine in his adventurous journey. He added that, after the experience of Mr. Erskine, he could no longer accept the hypothesis that the country along the banks of the Limpopo was the Ophir of Solomon. Unfortunately, the discovery which had been made of the lower course of this great river would have but little interest for merchants, since the shallows at the mouth would prevent its being commercially useful. Many years ago the coast and mouths of this and the other rivers of East Africa were surveyed by Captain Owen.

Dr. MANN said that after the close of the last session of the Society he was enabled, through the kind consideration of the President, to communicate to Mr. Erskine the cordial and material encouragement of the Society for his attempt to trace the lower course of the Limpopo; and it would readily be conceived that it was a great satisfaction to him to have the opportunity of recording Mr. Erskine's success before the close of the present session. The date of Mr. Erskine's start was definitely given in the opening of his journal. The date of his presence at the confluence of the Lalapuli and Limpopo was not recorded in the journal; but it was fixed by a casual memorandum of astronomical observations which was in his (Dr. Mann's) hands. It was curious that all dates are omitted from the concluding portion of Mr. Erskine's narrative; but we were fortunately able to fix, within a very narrow limit, the date of the completion of his expedition. He (Dr. Mann) received a letter from Mr. Erskine's father, bearing date November 17th, 1868, speaking with some anxiety of the last news he had received from the absent traveller; and he received another letter from him, dated November 30th, telling him of the safe and unexpected return of his son to Natal. He therefore completed his journey between the 17th and 30th of November, and was, upon the whole, six months engaged on the work. Mr. Erskine, in starting on his expedition, first made his way, with one personal attendant, by the help of chance lifts in ordinary transport-wagons, drawn by oxen at the rate of some three miles an hour, over the mountain-frontiers of Natal, through the Orange River Sovereignty, to Londenburg, in the Transvaal Territory. He then again crossed the Drakenbergen in a direct line for the position where the Lalapuli joins the Limpopo. Very soon losing all advantage from wagon transport, either for himself or his heavy impedimenta, the small means that he had provided to meet the charges of assistance from the Kaffirs were soon exhausted; and thenceforth he had nothing to rely upon but the kindness of traders casually encountered at some portions of his journey, and his own firm resolution to reach the mouth of the river. He struck the confluence of the rivers, and descended the channel formed after the confluence to the sea. He then retraced his steps along the main channel of the river, until he came into communication with a small party of traders that were upon its course, and, in company with them, struck across the wild desolate land of the Amamponda and Amaswazi tribes and through the upper corner of Zululand, the whole party being stricken with African fever, almost to death's door, during this fearful march. For some portion of this journey he bore along his own burden of scientific implements and materials for barter—which he hoped to make the means of successful exploration—amounting to nearly 70 lbs. of dead-weight, upon his own shoulders. He started upon this adventurous excursion with a very deficient supply of barter goods for making his way through the Kaffir tribes, and was badly equipped, as a matter of course, under the circumstances, with observing instruments. He found the confluence of the two great rivers; he tracked them to their termination, and made an exact sketch of the country both at the confluence and the mouth; and he then examined the physical situation and relations of certain rivers, the relations of which to the Bomba Hills have been

hitherto misapprehended, and has furnished a very admirable sketch-map of the country he has traversed, which is now in the hands of the Society. So much had Mr. Erskine accomplished: it only remained to add a few words concerning what yet remained to be done. The latitudes of certain positions visited by Mr. Erskine had been well fixed, and he had no doubt these latitudes were worthy of implicit reliance. He had supplied an important correction of the latitude of Leydenburg, and good latitude-observations for the confluence of the rivers and for the mouth of the Limpopo. The longitudes of the confluence and of the mouth of the river required re-examination. The reasons for this were obvious. During all the latter part of his lonely and unaided progress Mr. Erskine was only too fortunate to have been relieved of the grievous incumbrance of his artificial horizon. He used to supply its place by sundry rude devices, such as using the mobile surface of water; but it is, perhaps, on the whole, fortunate that he did not succeed, as the results of such methods of observation would, in all probability, have been more embarrassing than none at all. He would read extracts from a letter which he had just received from Mr. Erskine on this subject:—

"I have always believed that hitherto the weight of opinion has been in favour of the 'Ouro,' or Gold River, laid down as Orpen's, being the mouth of the Limpopo. Orpen, when in Ladysmith on a visit, in 1867, told me that this was the supposed mouth, and that he knew of no one who could identify the river at the sea, or, in fact, further than the confluence of the Lipahuli and the Limpopo. I conclude that this was Orpen the traveller, who gave Hall his information as to the Limpopo, as laid down in Hall's map. In Dr. Petermann's last map the positions do not differ materially from mine, except as to the sea approach. I have had to remove Leydenburg more than a degree of latitude and about half a degree of longitude from its place in Petermann's map. There is but one river of any size hereabouts; and I was informed by the Kaffirs that U'Sabia, the only other large river, flowed into Inhambane, and was about ten days' walk from the confluence of the Lipahuli and Limpopo. I was also informed by the Kaffirs that the mouth of the Limpopo, which I reached, was five days' walk from Delagoa Bay to the south, and ten days' walk from the Inhambane to the north. You now have the crude observations you asked for. Anything more can easily be obtained by an umlungu (white man) now well known to the natives of the Limpopo under the name 'Maskin' (Erskine), the 'mad son of the Government.' You, who have experience of African travel in a comparative paradise, an ox-wagon, can more easily imagine than I can describe the difficulties I had to encounter on foot, without beams or animals of any kind, amidst hostile tribes, suspicious of an explorer, and determined, if possible, to thwart his object, who know nothing of 'Somerset' (the native patronymic of Mr. Shepetone, the Natal Secretary for native affairs), 'or what he conceives to be all-powerful Natal. Umsidekaze knows us, and other tribes further north know us. But in this fever-stricken and fly-infected country they are 'know-nothings.' The latitudes, of course, are absolutely accurate, and the observations for longitude were taken by myself ALONE, and therefore took some twenty-six minutes for each. I lay on my back for the inner distances, and obtained good ones."

It will be remembered that no longitude-observation could be made at or near the mouth of the river; and Mr. Erskine himself very cautiously and modestly remarks that he has discrepant results with some of the other longitude observations, and that they therefore require further discussion and repetition. There remains, then, this final fact, issuing from Mr. Erskine's labours. In the best maps before Mr. Erskine's expedition, as in Petermann's, there is a large river-track marked from the confluence of the Lipahuli and the Limpopo to an embouchure lying within the 25th parallel of latitude

on the shore of the Indian Ocean, and marked "Ouri," or "Ouree." Mr. Erskine has shown that the river from the confluence of the Lipaluli and Limpopo does not go to that embouchure, but to a spot lying half a degree to the south of the 25th parallel, and very nearly coinciding with the embouchure of a smaller river marked on the maps as the Inhampure. This then only remains to be done. Means should now be found to send Mr. Erskine up by sea, to identify the spot he reached upon the Indian Ocean, and with the means of re-examining and fixing the longitude with final accuracy. The examination should then be extended to the so-called mouths of the Ouri and the Inhambane, lying a little further to the north, with a view also of finally marking their latitudes and longitudes. Possibly, in doing this, it may be also found practicable to determine what the relation of the U'Salia to the Inhambane is, and if there be an Ouri as well as an Inhambane, or Limpopo and Inhambane, where that Ouri seems to come from, as it certainly does not come from the confluence of the Lipaluli and Limpopo. It is scarcely possible to doubt that the influence of the Royal Geographical Society, which has begun this work, will be energetically and happily used to accomplish its completion.

There was one matter, of some interest, expressed in the sketch which Mr. Erskine has furnished of the mouth of the Limpopo. He has very exactly shown that curious feature of the South African rivers, the narrow channel of 300 yards breadth leading to a lagoon, or river-expansion above, of a mile wide. A few years since, he (Dr. Mann) crossed the mouths of all the rivers of No Man's Land with Mr. Scott, the Governor of Natal at that period, and every river had exactly the same conformation which is here delineated. A low heap of sand was piled up on the sea-beach almost entirely across the natural mouth of the river, leaving a narrow channel on one side for the tide to scour through; and in every case the channel was on the same side of the sand-bar as that which it holds at the mouth of the Limpopo, namely, to the south. In the season of flood the sand-bar is cleared quite away and the channel opened to the full width. At the termination of the season of flood the bar is again piled up by the sea, and the lagoon reformed. In the smaller rivers the sand-bar extends quite across from side to side during a part of the year, and the water rises higher and higher in the lagoon and along the lower tracts of the channels of the river until it acquires sufficient weight to burst the barrier. It is very interesting thus to find great natural forces marking their identity and proving their uniformity of action through regions of wide geographical extent.

Admiral SIR WILLIAM HALL related that he had the honour of commanding the first iron steamer, the *Nemesis*, which had ever rounded the Cape of Good Hope. Meeting with stormy weather, which nearly broke her in two amidships, the *Nemesis* reached the fine harbour of Delagoa Bay. At that time an American schooner attempted to ascend the Limpopo for the purposes of trade. They crossed the first bar, but were wrecked on the second. The captain and the second mate started on foot for Delagoa Bay, a distance of 90 miles, in order to obtain assistance. On the journey the natives attacked them; the captain was killed and subsequently eaten by these savages, and though the mate was left for dead, he succeeded in rejoining the crew. A vessel was sent round, and rescued the survivors. He could not give too much credit to Mr. Erskine for venturing among the savage inhabitants of that region. With the exception of Simon's Bay, there was no good harbour in our South African possessions; it was therefore much to be desired that the colony should be extended to Delagoa Bay.

Dr. MAXX stated that the island of Inyak, at the entrance to Delagoa Bay, was already in possession of the English.

Mr. J. Roussox said the colonists of Natal had felt warm interest in the

undertaking of Mr. Erskine. Referring to the alleged discovery of gold-fields in South-Eastern Africa, he said the representations of Karl Mauch, who, in company with Mr. Hartley, had explored the country north of Natal, were thoroughly credited by the colonists, though as yet very little gold had been obtained. Mauch was actuated by the desire that Germany should have its Livingstone, and he had undertaken to make his way through Africa from the Cape of Good Hope to Alexandria. It was his intention to acquire, by a lengthened residence in various parts, such knowledge of the people and the products as might prove of value to the world. He himself, after communicating the intelligence of his discovery of a gold region, left it to others to turn the information to account, considering that his mission was that of an explorer rather than that of an adventurer. Under the influence of his representations, a party was formed in the Transvaal Republic, of eleven men, who proceeded, fully equipped, to the alleged site of the gold-fields. They carried on their operations for a few weeks, but, after disagreeing among themselves, returned with only three ounces of gold and 5 cwt. of auriferous quartz, which has been since found to contain no gold at all. So far from being daunted by this, several other parties have since gone in search of the gold region; but, up to the date of the latest intelligence, no encouraging results have been obtained. Still he had seen, at Port Natal, trinkets made from gold obtained by the natives in the neighbourhood of the Limpopo, and had conversed with people who lived just beyond that river, who had assured him that from remote ages gold works had been carried on there. He did not think the Zulu country deserved the character of unhealthiness which had been given to it. Many who had resided there for years spoke highly of its healthiness and productive capacity. Around the Transvaal Republic the mineral wealth is great, and agriculture is being successfully pursued to some extent. The South-Eastern African states had before them a prospect of prosperity in a social and commercial sense which few people in England at present imagine.

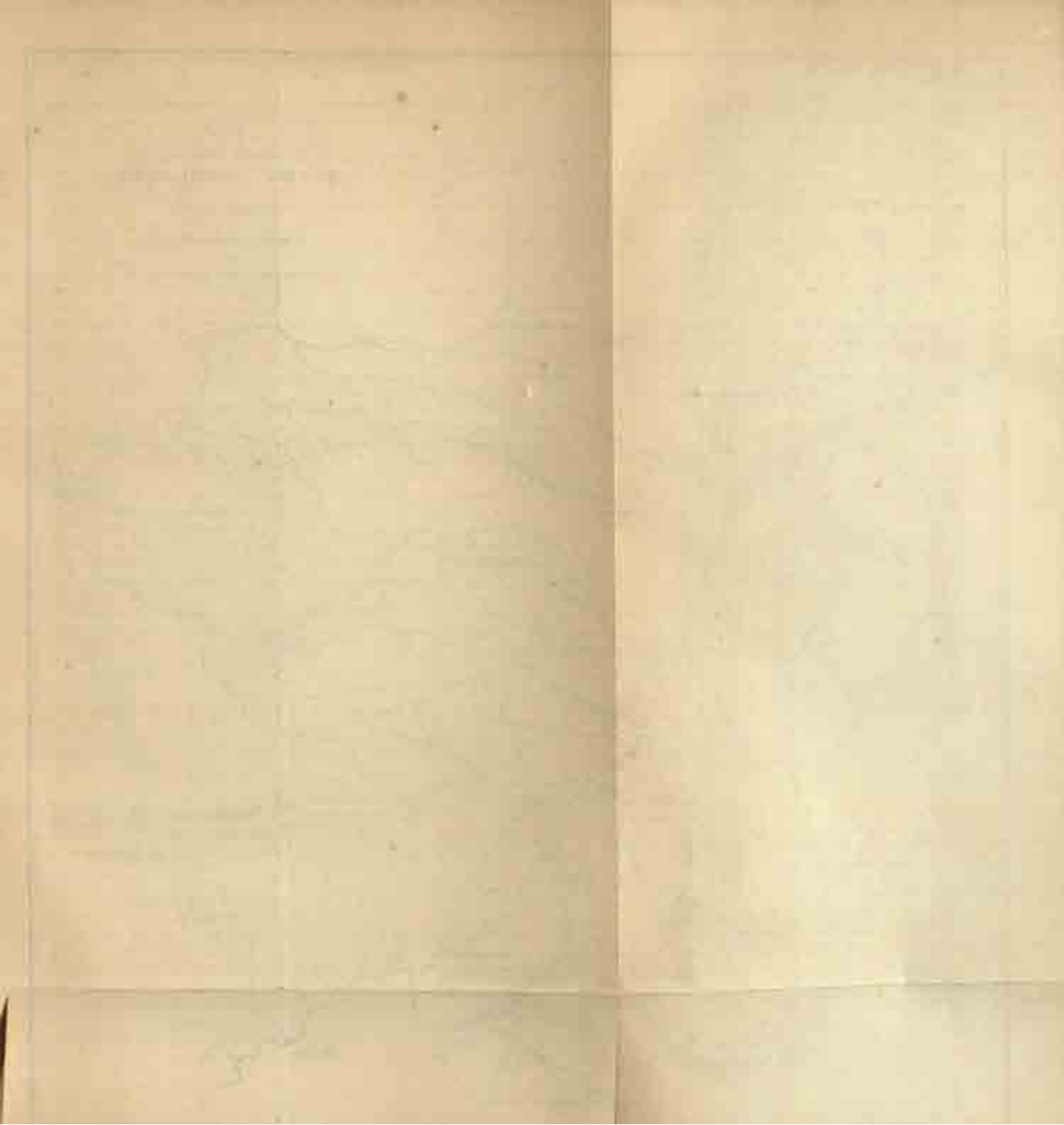
The President, in closing the discussion, announced the termination of the session, and expressed a hope that the next session, to commence in November, would prove equally successful with the one now concluded.

ADDITIONAL NOTICES.

(Printed by order of Council.)

- 1.—*Additional Remarks on the Bolor Highland.* By Colonel VENTUKOFF. Read at a Meeting of the Imperial Geographical Society on the 16th December, 1867, and translated by T. MICHILL, Esq.

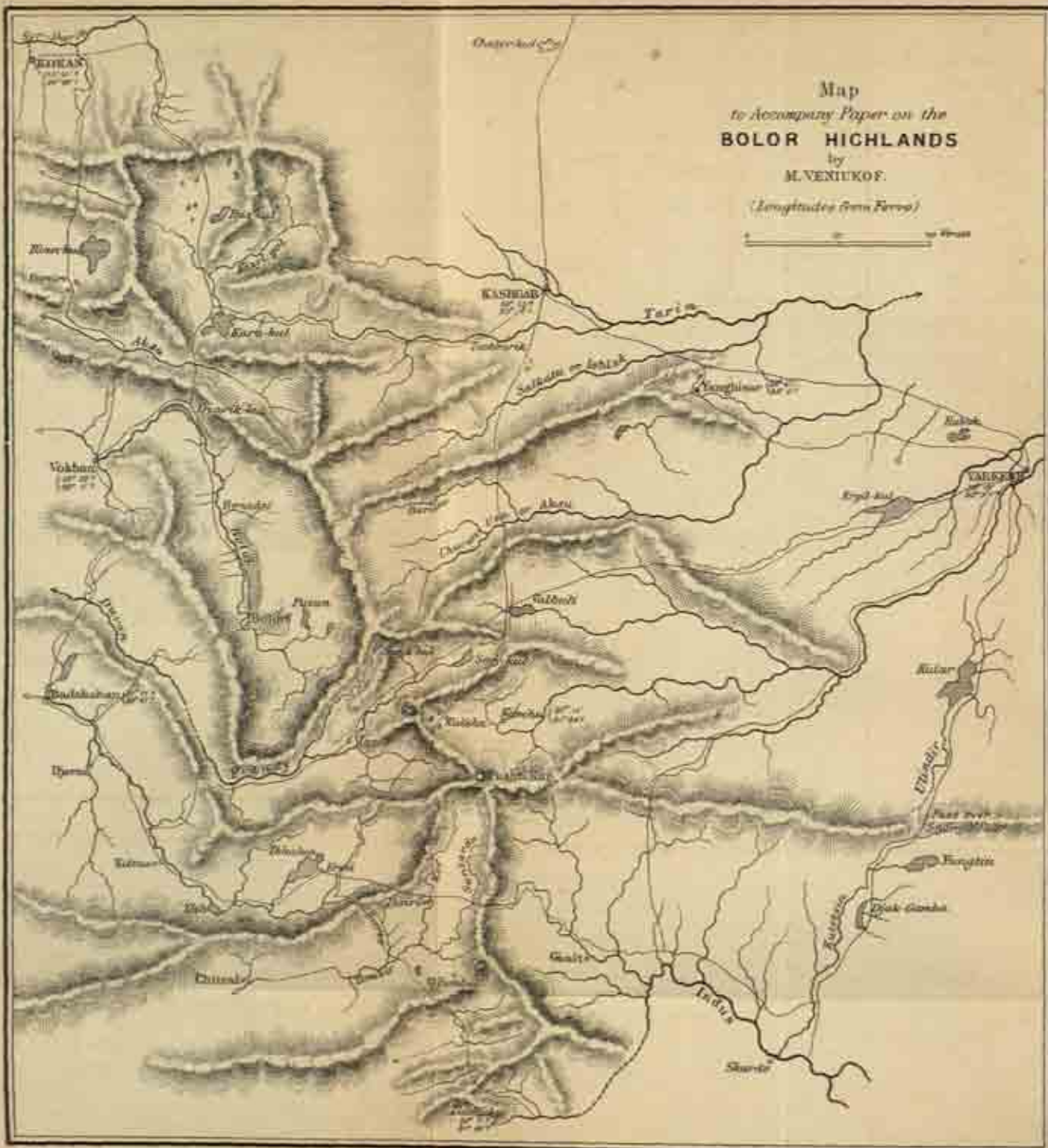
It is nearly seven years ago since I first directed the attention of the Russian Geographical Society to two extremely curious documents, preserved in the archives of the *Int-majors* at St. Petersburg, which add to our meagre stock of information respecting the geography of the Bolor, and of the whole country generally between the Syr-Daria and Indus, from the meridian of Khodjent to Kashgar, Yarkend, and the territory of the Maharajah of Cashmere. Although our knowledge of the geography of the Bolor has not advanced during these seven years, yet many explorations have been made in the adjoining countries, while scientific conquests, coincident with political advances, have extended



Map
to Accompany Paper on the
BOLOR HIGHLANDS
by
M. VENIUKOF.

(Longitudes from Ferro)

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180



on one hand to the northern confines of the Bolor plateau, i.e., to the Ferghannah valley; and from the banks of the Indus on the other, have penetrated across the northern slopes of the Himalayan range to the plains of Eastern Turkestan, named Khotan. These geographical successes are too well known to need consecutive account, more especially as the accompanying map, with the explanations which will be given in this paper, will embody all the explorations made up to the present time, excepting those carried out in 1867, and not yet made public.

I do not venture once more to direct the attention of our Russian geographers to the Bolor, solely because this plateau now almost adjoins our frontier, or on account of the probability of its becoming a field for our military activity; and consequently acquiring the interest of a question of the day. However important in their results, either present or prospective, may be the movements of Russia in Central Asia, it is not merely on this account that I am led to broach the subject of the trans-Ferghannah mountain region, more especially as the discussion of political changes is not within the province of this society. Such discussions are conducted by the Government, and the public are acquainted with them only from those short notices which the Government pleases to insert from time to time in the newspapers. In the daily press we occasionally meet with the observations of private individuals, which are generally very short, very superficial, and too evidently reticent. It therefore does not behove me, or anybody else engaged in the study of geography in Russia, to speculate upon the changes that may take place in the historical fate, not only of Central Asia, but of the whole of Russia, in consequence of the acquisition by Russia of great Mussulman territories in the basin of the Jaxartes, and of her approach to Bokhara—that centre of Islamism, the champions of which, in the persons of Kazy-Mullah, Shamil, and Mahomed-Amin, carried on a struggle against us in the Caucasus for 25 years. And whether such a contingency would be parallel to that which occurred in the first four centuries of the birth of Christ, when the Roman Empire spread itself from the Euphrates to the Danube, Rhine, and Tagus, and whether such an event would reduce Russia—the mistress of 66,000 square miles from the Volga to the Syr-Daria and Ili occupied almost exclusively by a Mussulman population—to the condition of modern Austria and Turkey, or whether, on the contrary, the vitality of the Russian race would gain the ascendancy,—these are questions which we need not consider. Our objects are more humble, and the political interest of the question only serves as an incentive to investigations purely scientific.

I also do not wish it to be considered that this article has a controversial object. However curious may be the opinion expressed by Sir H. Rawlinson respecting the authenticity and value of the MS. discovered by me in the military archives at St. Petersburg, I do not wish to dilate much on the disputed point, as polemical writing is not to my taste. Moreover a more experienced explorer than myself, M. de Khanikof, has already done his best to substantiate the conviction of genuineness which naturally forces itself on the mind on the perusal of the manuscript of the bold traveller who, starting from Northern India, penetrated into the Orenburg steppe, twice crossed over the Bolor mountain system, and explored almost the whole of it longitudinally. The dispute would, furthermore, prove a barren one, as neither I nor Sir H. Rawlinson have been in the part of Asia which forms the subject of this paper. Sir Henry has great knowledge of Iran, Mesopotamia, and Afghanistan, but he has never been north of the Kabil Daria, nor yet beyond the Indus.

With reference to the disputed point I beg to offer the following remarks, which, I must observe, are not dictated by any spirit of contention. Being desirous, after the expression of Sir H. Rawlinson's opinion, of verifying what

I have said with reference to the travels of Georg Ludwig von —, I took the first opportunity of re-examining carefully the MSS. that had been in my possession in 1860. This inspection convinced me, firstly, of the necessity of making a sketch, were it even in rough outline, of everything that had been written concerning Upper Asia; that is, it led to the compilation of the accompanying map, and, secondly, resulted in two interesting geographical discoveries hitherto unknown to science, and to which I shall refer further on. At all events, in no map or written account, is there any reference to a straight road from Yarkend to the Indus, in an almost meridional direction, and nowhere can we find any reference to the road from Ferghannah to Lake Karakul, a road which passes close to that celebrated Alai in Asia which forms the interesting point between the Bolor and the Tian-Shan.

The credit of these geographical discoveries is due, not to me, but to the truly enlightened courtesy of Count F. L. Heyden, member of the Council of our Geographical Society, who allowed me to rescue again from oblivion the same documents that had already been in my hands, and which had again been nearly lost among the dusty archives. Unfortunately I am unable to present here not only a complete analysis of these documents, but even so complete an extract from them as I would have wished; the materials were suddenly required for other purposes, so that they were in my hands but a short time. I did, however, see them, and I made a few extracts of geographical details, copying also the principal outlines of the map. It is the result of this work that I now venture to publish.

I must first of all observe that my principal authority this time will not be Georg Ludwig von —, who called forth the criticism of Sir H. Rawlinson, but an unknown Chinese traveller; may-be the Jesuit of the XVIIIth century, whose march-route was translated from the Chinese by Klaproth in 1821.* There are two copies of this itinerary in the archives of the *stat-major* at St. Petersburg: one which had been in my hands in 1860, and this, although detailed, is rather roughly drawn up; the other is bound up in the form of an album and has hitherto been quite unknown. The matter is identical in both, but the album copy is compiled with greater care, and on a rather larger scale, in consequence of which I preferred using the latter, although I was obliged also to refer to the former, as some of the sheets of the album had been lost.

The travels of Georg Ludwig von — were, however, not lost sight of by me, and notwithstanding the objections that had been urged against them, I again had recourse to the MS. for reference respecting the country between Kashgar and the embouchure of the Laimuka into the Indus, or that part which did not form the subject of the purely topographical enquiries in my article on the Pamir†. I must state, though, that this time I endeavoured to avail myself as little as possible of the disputed source, and adhered principally to the text of my Chinese authority, nevertheless I must again assert that I see no reason for disbelieving also the narrative of Georg Ludwig von —. It must not be forgotten that this traveller wrote his account after 1860, while his journey was actually performed in 1769 or 1770 (the latter is evident by a reference to a certain battle which was fought about ten years preceding his journey from Kashgar to the Bolor, and respecting which we have undoubted historical testimony that it occurred in 1758). A great

* See Lord Strangford's remarks on this curious subject, in the present volume of the 'Proceedings,' p. 21. According to him, the narrative of Georg Ludwig von —, that of the unknown Chinese traveller, and a third MS., from which Arrowmith derived the information mentioned in the note on the following page, all bear internal evidence of being written by one person.—[Ed.]

† 'Journal of the R.G.S.,' vol. xxvi., p. 248.

many things might consequently have become confused in his memory, many jottings made in his diary might have become illegible, and, therefore, not utilised. In this way I reconcile some small discrepancies which exist between his statements and more recent discoveries.* The accompanying map and succeeding observations will serve, as far as necessary, as a supplement to what may still be said with respect to his manuscript.

The route from Yarkend southwards, I must first of all observe, can be so correctly traced by scale on the map that I think it quite possible to bring it down to the banks of the Indus, almost opposite Skardo, with the position of which we have been well acquainted since the time of Cunningham and Strachy. It is true that in the Chinese itinerary there is no town of Skardo, but there appears the large river Kutesin, which cannot be taken for any other branch of the Indus than that (the Shigar) which discharges itself near Skardo. The route of our traveller then leads westwards, and even north-westwards, and leads us across the Bolor (or Himalayas, as both terms may be used, as I have already stated) to Dairim, Yabtuar, and Badakshan. I would here direct attention to this termination of the route at Badakshan, as the situation of this locality is sufficiently well known to us.

The following topographical details occur on this route which is laid down on the map, and which, I apprehend, is but little known only because it is a very difficult one, notwithstanding that it leads by the shortest line from Yarkend to Cashmere.

From Yarkend the road runs first for 15 versets in a south-east direction, and then intersects the River Aturah, doubtless the Youl-Arik of Klaproth's map.

Beyond the Aturah the road ascends and then descends to the *Elgair* rivulet, which flows into Lake Kular, and is 35 versets long. Lake *Kular* evidently belongs to the class of the same Alpine lakes, many of which are shown on Johnson's map of the territory of the Maharajah of Cashmere, and which are so numerous throughout the whole Boloro-Himalayan Highland, from the sources of the Indus to Sary-kul, Kara-kul, and Rian-kul. Kular is situated on a plain surrounded, however, by mountains on the north-west (Gornak), on the west (Butir), and on the south (Bunghi-Djmani). The last mountains are covered with snow. Out of them flows the *Ulandir* River, the southern affluent of the Kular.

The road from the banks of the Kular trends along this same *Ulandir*: first for 35 versets along a plain, and then through a pass. The whole valley of the *Ulandir* exceeds 70 versets in length. The upper course of the river runs in the high, snowy mountains, which are marked on the march-route as the boundary of Thibet. Beyond a high descent on the south, the road extends along the valley of the Kutesina river, the whole length of which to the Indus is about 120 versets. The valley of the Kutesina is very deep, and so obstructed with masses of rock, that at one part the road makes a detour and ascends an adjoining plateau, where it passes close to the alpine lake Djak-Ganba. The elevation of the ground around Lake Djak-Ganba is so great that the snow only disappears off it in the month of July; its height is not less than 13,000 feet above the level of the sea.

The road bifurcates within 20 versets of the Indus. One branch, the shortest, runs to the s.e., to the banks of this river, and terminates at Dimunga, which place I have not as yet been able to find on European maps; the other and longest branch turns to the west and proceeds beyond the Bolor. This part of the route intersects the following tributaries of the Indus:—The Pungbu, with

* It would be interesting to know whether these explorers did not make use of the labours of Georg Ludwig von — without knowing his name. For instance, whence did Arrowsmith procure in 1834 the configuration of the Bolor River, Lakes Kara-kul and Rian-kul, and of the Yaman Daria River?

the branch of the Ongo, the Utraighi, and Ghernuk. After the falling of the Tugtakhirn with the latter river, the road runs towards a snowy pass across the Bolor situated at Olgenmurl mountain. After this it intersects the Santardu rivulet, which I hold to be the commencement of the Kamekh of Kafiristan, and the source of which is situated at about 35 to 40 versts from the point of crossing. At its source there are glaciers and moraines, or at all events blocks of ice.

Beyond Santardu the road intersects the Kof* Rivulet of the same Kamekh system. Here, not far from the right bank of the Kof, on a high rock, stands the town of Dairin, already marked on Arrowsmith's map of *Burmes' Travels*, namely, at the upper course of the Kamekh. At Dairin grapes are cultivated in the valleys and on the southern slopes, a fact which serves as an important characteristic of the country and climate, and partly of the customs and religion of the inhabitants. We must not forget that among the more southern inhabitants of Kafiristan, bordering the Cabul-Darya, wine making is very general, as testified by Mullah-Nodumb, Ravery, and Masson. On reference to the account of Georg Ludwig von —, we find that he also drank wine on the banks of the Indus near Limmuk, as also northwards under 36° of latitude, which, in my opinion, presents an argument not devoid of weight in favour of the accuracy of his statements, inasmuch as not having had any traveller to precede him in these regions, he could not at haphazard have invented a fact which is unanimously confirmed by three European authorities (who did not, it is true, penetrate very far into the country), as well by the unknown Chinese traveller, who went over the same ground in a transverse direction.

From Dairin the road proceeds to the westward, parallel to a rivulet, on the southern banks of which there are lapis-lazuli excavations. Here it is, I apprehend,—without asserting it, however, positively,—that our Chinese traveller intersected the route of the enigmatical German.

Farther on the road leads to the small town of Erghen, situated on the banks of the Gkhalun lake. The direct distance from Dairin to Erghen is a little more than 40 versts, and on this extent occurs the river which I am inclined to identify as the Arding of Georg Ludwig von —, and at the same time as the commencement of the Sharna,† *i.e.* the Badakshan branch, Amu-Daria. This rivulet, at the point at which, farther to westward, it receives the overflowing waters of the Gkhalun Lake, bears the appellation of the Uigurita, and on its banks we again meet with vineyards. After this it falls into lake Ush, and flows thence beyond the boundaries of Kafiristan, past Yabtuar, in the direction of Badakshan, where our march-route turns northwards, into the valley of the Bolor river.

To these details I can add nothing at present, as, for the reasons already stated, I was not able to take a sketch, or copy the description of the itinerary. It is easy, however, to see that the route just described passes through the most unknown countries, and that the portion of it from Yarkend to the Indus fills up at once the void which exists on Klaproth's map, and which is designated on it as Little Tibet. I must also add that no mud camping grounds are shown on the march-route in neighbourhood of Kular Lake; while many temples and monuments, of course of Buddhist origin, are marked along the portion of the road which adjoins the Indus. The region lying to the north of Cashmere and the Indus, was, according to tradition, the birthplace of Buddha.

I shall now direct attention to another interesting road, namely, that from Kokan to Kam-kui.

* This river, it must be supposed, is the same that occurs in Arrian's description of the campaigns of Alexander the Great.

† In spite of what is marked on my little map of 1861, where the Arding is hypothetically made to enter the system of the Kamekh.

The road from Kokan trends first to the east, and probably only a little eastward of Marghillan (not shown in the itinerary) turns to the south; here it bends round a small sub-alpine lake, Lari-kul, and enters the Tamuk-Su Valley, a river already known, as it appears, under the name of the Kamuk-Su on European maps.

Gradually ascending the Tamuk-Su, the road leads up to the pass of the Daur-Tan range, or the western continuation of the Tim-Shan, after which it runs along a high mountain plateau dotted with lakes. Among these the largest is called Huz-kul, which is situated not more than 70 *versets* from Kara-kul and Rian-kul, and evidently covers the crown of the upheaval known to the westward under the name of Masgulak, and on the south-westward forming the Pamir.

Descending from the plateau the traveller enters the valley of the Kara-gol River, already known from the description and map of Georg Ludwig von —, and also from Klaproth's map. Then, somewhat below the confluence of this river with the Kizyl-gol, the road leads out to Kara-kul, and runs thence, through the same narrow valley described by the German, to the banks of Dzarik-kul, and beyond, on one side to the Bolor, and on the other to Volkhan, just as shown on my map of 1861.

I might adduce further interesting particulars from the same Chinese source respecting the roads from Kashgar to Yarkend, and along the Gunduir River in the direction of Chatyr-kul Lake. But as these roads lie beyond the confines of the Bolor mountain system it will be sufficient merely to mention them, observing that the route northwards from Kashgar will, in all probability, be described in a memoir by those persons who took part in the Chatyr-kul expedition of this year.

Such are the few, though not unimportant particulars which I wished to make generally known as geographical novelties, rescued from oblivion, thanks to the facilities afforded me by Count Heyden. I shall now attempt to give a brief sketch of the changes which the geography of High Asia will present consequent on the discovery of these new materials. My map, which accompanies this article, is an attempt to represent at a glance the principal features of the Boloro-Himalayan system, and I must therefore say a few words about it. The map was constructed from the following materials:—

1. All the countries from the Syr-Daria and the neighbourhood of Khodjent and Dzhazab, to the south of that river, according to Russian maps. The astronomical points are taken from Feodoroff, Lenin, Butakoff, Golubeff, and Struve.*

2. The Ferghannah Valley and the affluents of the Syr-Daria, between Kurtha and Khodjent; according to Klaproth's map of 1836, my own of 1861, and Struve's of 1867. But the present map differs materially from all the preceding maps, and is, strictly speaking, the result of a special enquiry, which I have not as yet completed in detail. The astronomical points of the Jesuits and of Abulfeda have been discarded by me; but, on the other hand, I have not blindly followed M. Struve. Thus I have placed Kokan, Marghillan, Namangan, Andidjan, and Ush, considerably more to the north than they are made to appear on his small map of 1867. A more correct delineation of the features of the country is obtained by the way in which I have elaborated existing materials; and I hope that correctness of the principal bases of my map will be confirmed by future surveys.

3. The Valley of the Zariashan—according to the map of Khanikof, with

* For the upper course of the Syr-Daria, along both banks, as far as Chatyr-kul Lake, the explorations of Mr. Poltorinski and Baron Osten-Sacken might have been used; unfortunately, the result of their travels has not been published as yet.

the corrections made in 1858. The upper part of the valley I have moved a little more to the south (without altering its outline), and I have also marked the hypothetical Lake of Iskender-kul, which appears, on Struve's map, at the upper part of the left source of the river.

4. The sea of Aral, according to Butakoff; and the steppes to the eastward of it, according to the maps of the Military Topographical Depot.

5. The River Amu-Daria from Chardjui to its mouth, according to Russian surveys of 1858 and earlier; the Delta according to Butakoff. The astronomical points from Struve and Butakoff.

6. The country on both sides of the Amu-Daria, from Chardjui to Kunduz, between the Hindu-Kush, Paropamisiz, and the Fan-tan mountains—according to Burnes, Kharikof, and Vambéry.

7. Khorassan to the west of Herat—from our maps of 1858-65; and the astronomical determinations of Thuillier, Fraser, Lemu, and others.

8. The region east of Herat to the Hindu-Kush—according to Burnes and other English travellers.

9. The Valley of the Kabul-Daria—according to Colonel J. Walker; and for its left affluents, Macartney's map in Elphinstone's 'Travels,' and that of Arrowsmith in Burnes; Lumsden's, however, I was not able to refer to.

10. The River Indus and its affluents above and below the Himalayas—according to the English maps of Stacchev, Montgomerie, Waugh, and Colonel Walker, though only in general outlines, as these localities are beyond the Turkistan and Bolor Plateaux.

11. The country from Leh to Khotan, also in general features—according to Johnson.

12. The road from Yarkend to the banks of the Indus, through Little Thibet, and thence across the Bolor range to Badakshan—according to the Chinese itinerary above mentioned.*

13. The region between Sary-kul and Kunduz—from Wood's account.

14. The mountain region between the Indus and the Syr-Daria, along the Bolor chain and on both sides from it; according to my map of 1861, from which, however, I have been obliged to make two deviations in order to reconcile it with Struve's data: namely, I have placed more to the southward that part which adjoins Dairim, as also the source of the Zariatschan and the region north of it to the Syr-Daria.

15. Eastern Turkistan—from the maps of Klaproth, Berghaus, Kiepert, and partly from that of Mr. Zakharoff. Some peculiarities, however, of this last map, notwithstanding its minuteness of detail and careful finish, restrained me from using it too much, particularly as it has not been published and is not accompanied by any explanatory text. Similarly I made no use of the description of Aityshar by the late Valikhanof, who had no instruments with him during his travels and supplied no maps on his return, neither did he make any excursions in the neighbourhood of Kashgar.†

16. Lastly, I carefully studied the map attached to Vambéry's travels, which is very similar to mine, with the exception of the outlines of Kiaffistan.

* When I compiled my map, and wrote this article, I was not able to refer to Montgomerie's account, inserted in the last 'Journal of the Royal Geographical Society,' inasmuch as this Journal had not at that time reached St. Petersburg.

† In addition to this, the account of this talented traveller was written partly during his illness at Omsk, with the assistance of Colonel Gutkovsky, and partly at St. Petersburg, a year and a half after his journey, with the assistance of the maps of Zakharoff, Nifantseff, and even Georg Ludwig von — (an extract from whose MS. relative to Kashgar and the neighbouring regions was communicated to Valikhanoff by myself).

From this enumeration it is easy to see that I have tried to be impartial, and to avail myself of the best maps. If I have alluded with great reserve to one of these maps which has gained a certain notoriety in Russia, although it has not been published—and which is, therefore, not subject to criticism—namely, the map of Mr. Zakharov, I consider I have done so not without just grounds. But anybody may convince himself how incorrectly the meridians and parallels are marked, and how inaccurately the rivers and mountains are delineated in localities with which we are now acquainted from surveys, as, for instance, the country south of Issyk-kul, where between this lake and the Naryn two parallel snowy ranges are shown, with no small number of arbitrarily-heading rivers. Let me now turn to my results.

(a) Some of the mountain-ranges on my map are marked darker than others, while some have merely the direction of their principal chains sketched out. By these *three* methods I wished to distinguish the degree of certainty of the geography of the different countries shown on the map. Where European surveys (Russian or English) have been made, or respecting which country there are *two* other sources of information, the mountains are shaded dark; where the country has been mapped only on a small scale, or mapped from neither Russian nor English surveys, the mountains are shaded lighter; and lastly, in the case of countries altogether unknown, blanks are left or hypothetical lines laid down. Every map, in my opinion, ought to contain on its face a geographical account of what is known and what still remains to be known.

(b) The map shows that the Bolor chain may be recognised as existing along the whole extent from India to the Syr-Daria, but not farther northward, as Humboldt supposed. At the same time the Bolor is not an independent range, but is a direct continuation of the Himalayas, describing an arc from the banks of the Brahmaputra—where its direction is parallel to the equator—to the banks of the Syr-Daria, where it almost coincides with the meridian.

(c) The system of the Bolor, like that of the Himalayas, does not consist of almost one straight water-parting between the basin of the Tarim on one side, and the basins of the Oxus and Jaxartes on the other. On the contrary, the water-separating ridge runs in a broken line, although the highest summits may probably rise along one certain axis, which may be drawn from the banks of the Indus, eastward of Laimuka, through Pishtikur, which we must suppose to be near Karchu, and through Tengri-Tub, to the north-east of Karakul to Soliman's Throne near Ush. This axis, as may be easily perceived, is intersected by two rivers: in a direction from east to west by the principal source of the Oxus, and from west to east also by the principal source of the Tarim—the Yaman-Yar-Osteng. In other parts, with the exception of parallels $37^{\circ} 20'$ and $39^{\circ} 10'$, it is evidently coincident with the water-parting, and gives rise on one side to the Suvat (Marikpass, Lendao) Kameha, Sharud, Bolor, Zariafshan (Aksu), and Asferakh-chan (Galinglik); and on the other to some small tributaries of the Indus and the principal tributary streams of the Tarim-Pol.

(d) These principal features cannot, in my opinion, undergo much change in the future, inasmuch as they are based on sources independent and confirmatory of each other. We are, of course, very poor in astronomical points for these localities; even those that we have are open to doubt, but then we have a network of rivers and roads. The latter are interesting, as they do not only consist of roads intersecting the Bolor transversely, but also roads running parallel to each other. In 1843, Humboldt was not so rich in facts, and could not consequently arrive at results fully satisfactory in his exposition of the geography of the Bolor; which exposition, however, must, in fairness, without any exaggerated submission to his learned authority, serve as the constant point of departure for all later explorers.

(c) The roads to which I have referred are as follows:—

1. On the north, at the very edge of the Bolor system, and almost within it: the road from Kashgar to Ferghannah, through Ush, from whence in the south, is seen the beeting height of Soliman's Throne. This route, unfortunately, was not graphically described by those travellers who gave an account of it, i.e. by Mir-Isset-Ulla, and the author of the so-called Russian *marche route*. Notwithstanding the great antiquity ascribed to it by Humboldt, we are, up to the present moment, as ignorant as ever with regard to it; and it continues to puzzle those who attempt to compare the tracing of it on different maps, such as those of Klaproth, Berghaus, Kiepert, &c.

2. Throughout the centre of the mountain land, almost on the same parallel with the celebrated Pamir plateau, lies the road from Kashgar to Vokhan, where we can identify many minute geographical details in the account of Georg Ludwig von —, and in that of the unknown Chinese traveller.

3. More to the southward a transverse road runs from Yarkend to Badakshan, past Lake Sary-kul. The western portion of this route is well known to us from Wood's description, while with its eastern half, in addition to Klaproth's map of 1836, we are acquainted from the survey of Georg Ludwig von —.

4. Not far south from Sary-kul there is a new road across the Bolor from the upper source of the Sharud (Arding), and probably from the Sarkind (the left affluent of the Pami) to Valhinn Lake. This road is consequently only a southern ramification of the road which leads westwards and south-westwards from Yarkend; it may, however, also be connected with Karchu, &c., form a separate line of route across the Bolor. In order to settle this point it would be very interesting to explore the route of Benedict Goes, for if the existence of direct communication from the valley of the Arding to the valley of the Yarkend-Iaria near Karchu, and consequently near Pashitkur, be ascertained, in such case Elphinstone's assertion that the Oxus takes its rise near Pashitkur would be confirmed.

5. Farther to the south there is a road from the Northern Indus along the Tugtahiru to Dairin, and then on to Sharud. The information respecting this route contained in the Chinese march-route is so circumstantial that it may be compared with good itineraries for European countries; of course a more careful identification of names than could be done by me is to be desired. But doubtless such identification will soon be accomplished, as the great nation which rules on the banks of the Indus will not fail to send explorers to the mountainous region surrounding Ghilghil, who will be able to set at rest all doubts which may still be entertained with regard to the plateau between the upper course of the Sharud and the northern bend of the Indus.

6. We may accept as the southernmost of the parallel roads of the Bolor mountain system the one which leads from Yarkend, along the Yarkend-Iaria and one of its affluents (the Tadbuna) to Nagar, and to the above northern bend of the Indus. But this road may more justly be considered as running more parallel with the Kuen-Lun than with the Bolor.

7. As regards the longitudinal roads I am, as already stated, acquainted with three. Georg Ludwig von — leads us from the banks of the Indus, starting from Iatunka, to Kashgar, first, it is true, along the western, and then along the eastern slope of the Bolor. Both he and the Chinese traveller also mention two parallel roads from the Ferghannah valley leading almost due south; one leads along the Tamuk-Su River, past Lake Kara-kul to the town of Bolor; the other along the Kae-jush, past Rim-kul, and through Vokhan to Badakshan. The road from Karchu to the northern Indus may also be regarded as one of the parallel routes of the Bolor; it is particularly interesting, as it will afford a traveller the possibility of studying from the

eastern side the formation of the mountain knot between the Bolor and Kun-Lun (the existence of which cannot now be doubted in spite of the opinion expressed by Thomson and Schlagentweit), as similarly the road from Laimuka to Kulaha lakes presents the means of observing the intersection of the Bolor by two, or even three, parallel ranges on the west, the northern of which may be called the Hindu Kush proper; the middle one is the Lopchia range, while the third, which is nearest to the Indus, and partly parallel to it, has as yet no name.

All the enumerated roads intersect each other in several knots, and it is evident that if we had the astronomical position of these knots the geography of the Bolor would be as perfect as could be expected for a region so difficult of access. Unfortunately we do not possess this information, and neither the determinations of Georg Ludwig von —, nor those of the Jesuits within the limits of the Bolor, can be accepted as a basis for any new labours. I have, therefore, made my *network* of routes, &c., rest on the smallest number of points lying however not very close to the longitudinal axis of the highland region. These points are Kashgar, Tashburik, Yarkend, Kamlu, and the northern bend of the Indus to the east of the Bolor, Lake Sary-kul at the centre of its extension, and then Peshawar, Djermi, Varziminoor (both these points are not astronomical, but connected with astronomical European surveys), and Khodjent on the west. I leave it to future explorers to correct the errors I may have made; at the same time, however, the labour of future researches may be rendered easier by the publication of the following approximate co-ordinates of the chief points of High Asia as they appear on my map:—

	North lat.	Long. E. of Ferro.
1. Kokan	40° 39'	88° 27'
2. Centre of Mangulak plateau ..	40 2	88 43
3. Western extremity of Rian-kul ..	39 30	88 41
4. Vokhan	38 23	88 45
5. Bolor	37 31	89 44
6. Badakshan	37 7	88 40
7. Erghen	36 20	90 23
8. Embouchure of the Laimuka into the Indus	35 0	91 48
9. Southern extremity of Djak-gamb lake ..	35 57	93 38
10. " " Kolar lake ..	36 9	93 43
11. Western extremity of Valtun lake ..	37 44	91 38
12. Source of Tapnar out of Kam-kul ..	39 9	89 42
13. Buz-kul lake	39 41	89 27
14. Ush	40 37	90 13

The 1st, 2nd, 13th, and 14th of these points are apparently not far from our frontiers, and not inaccessible to bold explorers from the north. I consider that the distance from Khodjent to Kokan is not more than 110 versts; 125 versts to the place where Georg Ludwig von — crossed the Mangulak; 150 versts to Rian-kul, 200 versts to Buz-kul, and lastly, 240 versts to Ush. Let us hope that these places will not long remain unknown, and that our subsequent knowledge of the geography of the Bolor will not be based on hypotheses and surmises, but on accurate data.

October, 1857.

* Approximate probably within 3° 4' of latitude and 5° 7' of longitude; that is supposing always that the principal points, such as Kashgar, &c., are correct.

2.—*Notice of a Bifurcate Stream at Glen Lednoch Head, Perthshire.* By
Capt. T. P. WHITE, R.E.

(Communicated by Lieut. WHITE, R.A., F.R.G.S.)

A FEW miles from Comrie, in Perthshire, at the head of Glen Lednoch, there is a singular example of bifurcation, a notice of which, it is thought, may be interesting to the Royal Geographical Society.

A small rivulet rises under a craggy hill, one of the "Meall Buidhe" * Ramms, which separates the drainage systems of the Tay and Earn. The cliff is named "Crag Uigeach" (Anglice, crag of nooks or solitary hollows), and the feature appears on the Ordnance Survey published plan (6-inch sheet, 81, Perthshire). For a short distance the stream takes the course of a well-defined gully, till it is met and split into two by a very slight but immediate rise in the ground, which forms, as it were, the nose or narrow end of a pear-shaped bump or eminence. This bump, a little raised above, and therefore isolated from, the neck immediately south-west of it, is the extremity of a new ridge, which, starting from the fork, carries on the main watershed, hitherto coincident with the direction of the stream. This coincidence will be more clearly understood by regarding the valley down to that point as a mere groove in the watershed ridge. Of the two waters, after divergence, one becomes the "Finglen Burn," and descends into the valley of the Tay; the other, passing into Glen Lednoch, is a feeder of the river Earn, reunion being ultimately established in the Firth of Tay. A loop is thus formed which insulates a large area of the county of Perth, speaking roughly, about one-fifth.

My first observations of this feature were made in November, 1867, and reported to Sir H. James, Director of the Ordnance Survey. Shortly afterwards they were noticed in the "Athenæum" journal, and elicited from other correspondents some information, apparently making out that the bifurcation had been artificially produced. In face of the evidence adduced it seemed I had been mistaken, and in a subsequent letter I acknowledged the supposed mistake. In any case of the kind, exhaustive evidence to satisfy that no past disturbance of an artificial character had ever taken place would be almost impossible to obtain. In the present instance, however, what was stated against the idea of natural bifurcation broke down on subsequent inquiry. It was advanced by the late tenant of the ground, on the authority of his shepherd, that the stream originally flowed all into Glen Lednoch till a diversion was effected to the Finglen Burn by a former miller on Loch Tay side for the supply of his mill in dry seasons. Upon this point I took the evidence of three persons—the shepherd himself, the present tenant of the mill referred to, and the farmer of the adjoining land. Their statements, which were reported to me in writing, were taken independently, and entirely accorded. They are too lengthy for me to do more than sum up as follows:—

1st. That a former miller is believed to have placed a small dam at the fork of the stream, to *increase* (not to *create*, be it observed) a run of water to his mill on the Finglen side.

2nd. That the existence of the double outlet had always been regarded in the district as natural.

To this I may add the opinion formed on re-examination of the ground by an experienced observer, who considers it would require a considerable outlay to confine the waterflow permanently to a single channel either way, as the bifurcation would probably be restored by the first flood. Again,

* Yellow-hill.

the supposition of an original single channel into Glen Lednoch is further contradicted by some levels which were taken during the second inquiry. These showed that the Finglen branch has a steeper fall than the Lednoch, at first leaving the fork in the proportion of 3 to 2, a point 20 feet distant therefrom in the former, and one 30 feet in the latter, being on the same level. The channel, however, being wider in the Lednoch, keeps the flow of water pretty equal in both.

It was also remarked by another correspondent that a stone barrier lay across the bed of the stream at the divergence; and this seemed to require examination. I therefore had the stones, three in number, removed for some hours. The result was to make little or no difference to the waterflow, which remained as before, nearly equally divided.

The bump or breakwater eminence was found to be of a firm soil, not peaty, but covered with a coarse grass. As you pass to the south-west up the watershed, "peat hags," as they are called, break out on the neck adjoining the eminence; but at this, the lowest point in the ridge, the ground still stands high and clear, forming a marked water-parting between the two forks of the stream, as will be seen by the sketch.

The run of water is a good decided one both ways, with all the character of a mountain rivulet.

3. *Extracts of Letters from W. WINWOOD READE, Esq., to ANDREW SWANZY, Esq., F.R.S.S., relating to his journeys in Western Africa.*

MR. W. WINWOOD READE left England on a journey of exploration in Western Africa, in May, 1868, under the auspices of the Society, and aided by Mr. Andrew Swanzy, the West-African merchant, so well known for his liberality in encouraging all scientific effort. The original intention of the traveller was to ascend the Assinie River and penetrate, if possible, to the Kong Mountains. Foiled in this by the opposition of chiefs near the coast, and a native war, he accepted, after several minor excursions, an invitation from Sir Arthur Kennedy, Governor-in-Chief of our West African possessions, to explore the interior from Sierra Leone, and thence to the upper waters of the Niger. According to the last news (August 1st, 1869) Mr. Reade was on his way to the sources of the Niger, from Falaba, and had reached a town called Farabana, having 10,000 inhabitants, on the upper waters of the great river.

"Accra, Sept. 5th, 1868;

"The Assinie settlement is not at the mouth of the river, which is some distance to windward. This river, on arriving at the seacoast, instead of debouching, runs along the side of the beach for some way, and then discharges itself into the sea over a bar impassable to shipping. At Assinie, the strip of land between the river and the sea is exceedingly narrow; it is occupied by a native town, called Maña, inhabited chiefly by traders. The houses are of wood, small and dark; there is no stockade, and very little to show the wealth which yet probably exists there. There are two French factories—small wooden houses—which, insignificant as they are, cost a good deal of money. At Assinie there appears to be no skilled labour of any kind, excepting the carpenter and other artisans, who come from Senegal. With respect to provisions, the plantain and cassava, as in all forest countries, are the staple, as maize is after you reach Azim, and as rice is at some point which I have not yet ascertained the other way. Maize is grown in small quantities, but is not, I believe, made into *luskas*, or country bread. There are also yams. The plantain is frequently eaten in the form of *fonfoo*, a kind of dough, well known along the coast. Poultry, sheep, and bullocks appeared

tolerably abundant; though here, as on most other parts of the Gold Coast, the natives are very reluctant to dispose of their cattle. There are no horses; the noble animal is not indigenous, to my knowledge, anywhere between the Casamance and Accra.

"On landing at Assinie, then, the traveller beholds a desolate strip of white sandy beach, sloping precipitously to the sea (as the beach seems always to do where the surf is violent), covered with broken shells, pieces of sea-worn wood, and huge masses of froth. On looking to the right and left, he would see a thick, scrubby vegetation, and high trees in the distance. This, with the miserable appearance of the village and the French factories, would not prepossess him in favour of the place. Added to which, the sea around is desolate: not a canoe upon the waters, not a net upon the sands. But when he walks a few yards from the beach, what a sight meets his eyes! From the fury and turmoil of the surf, from the gaunt desolation of the beach, he finds himself transported to the shores of a beautiful river, which flows tranquilly past, and upon the bosom of which paddle numerous canoes. The scene is completely changed. He sees around him the forest scenery of the tropics, which, though in course of time it becomes monotonous, is at first always enchanting. On the opposite shore another village meets his eyes; and although it is built in the same manner as that on the beach, peeping out from amongst trees and shrubs and tall waving grass, it presents a very different appearance. The European residents at Assinie consist of the commandant, Captain Gustave Martin, the doctor, a French trader, M. Chatelain, commission agent for a French house (associated with Gehring); and a sergeant. There are about a dozen Senegal tirailleurs at Grand Bassam, natives, and excellent soldiers. There are a few cannon, but, as there are no rocks at Assinie, a fort could not be constructed there without great expense. The fortifications—such as they are—are powerful enough to resist any attack of the natives, who, for that matter, are exceedingly peaceable and well-disposed towards the French. Respecting the resources of this country, I shall be able to say more when I write again; but I think that Assinie must always have been a successful trading station, for this reason: the King is decidedly one of the most powerful monarchs—perhaps the most powerful, after Dahomey or Ashanti—on the coast: power in Africa is derived solely from wealth, and wealth from trade with white men. The road from Coomassie to Assinie, according to Dupuis was, at the beginning of this century, one of the four great thoroughfares from that capital to the coast, and these four great roads naturally led to the four chief stations of trade. But, when we speak of Assinie trade, of course we speak of Ashanti trade. Assinie is simply a port of that country. Except Kinjaba, which is a very large town, the Assinie country appears to be very thinly populated, indeed; and, as I have already been over a good part of it, I can give an opinion upon that point. As soon as I entered the gate of the stockade, I saw the commandant and his two companions, seated at breakfast, on the southern bastion, which joins his dwelling by the piazza. I sent up my letter from the French ambassador in London, and was, of course, received with enthusiasm and also with sincere cordiality. I explained to him my desire of going to Coomassie. He said at once that it could be done, but made it almost a stipulation of his assistance that I should go as a Frenchman. I agreed to this; and, as far as the Assinies and the Ashantis are concerned, the race has succeeded perfectly. I have little doubt that I could go and return from Coomassie without being detected. I certainly had no choice about accepting the commandant's advice. The great difficulty of all is to overcome the jealousy of the coast tribes, and for this I required the *Ashanti* co-operation of the commandant, who would, of course, have disclaimed the responsibility of my failure at the outset on the grounds that I had not taken his advice.

"It so happened that M. Chatelain was going up to Kinjaho in the course of a few days. I was thoroughly occupied during two days in disembarking the goods and chattels you provided for me, and in storing them in my apartments. . . . We started at about 1 o'clock in the Government yawl: eight paddlers, six of them Chatelain's Kroomen, two provided by myself, and the Government interpreter *Gustor* at the helm. After two hours' paddling up the river we entered a beautiful lake 15 miles in length and about 8 in width, very shallow in parts. Even in the middle we could see sticks standing up, and which marked the fish-traps of this country, which are made of hollow tubes of wood, with a funnel-shaped basket so arranged that fish can go in, but cannot get out. . . . The river, as we now found it, was very narrow and tortuous for some distance. There was an upward movement from the bar of some dark muddy rollers, but soon the true current became perceptible, and in an hour's time it became difficult to stem. There were but two or three villages on the banks. These were built on piles; in one the water had mounted so high that the villagers had fled, and in all they had to go from house to house in canoes. About half-past six, diving into a little narrow creek, we touched at the landing-place, and some torches being made on shore from long strips of some kind of bamboo we were able to start for the town, which was about half a mile off. Having walked along a very good forest path by the light of torches, we emerged before long into the town, where we took possession of the house of reception, used only for such strangers as might pay a visit to the king. We arrayed ourselves, as well as we could in semi-darkness, in the grand chamber, and awaited the coming of the king. "Here is Amatifoo," said the interpreter, touching my elbow; and turning round I saw a tall, dignified-looking individual who was holding out his hand, which I grasped and slapped after the manner of the country. His manners are decidedly royal. We slept on the state couches, and palavered in the morning. The king's answer to my application was given without any hesitation. I could go up to Coomassie, if I wished it, as soon as the roads were passable, and he would assist me to do so. At present they were flooded. At a subsequent interview I obtained his permission to converse with the Ashantis then at Kinjaho. This conversation was also satisfactory. They explained to me the necessity of sending a messenger to the king, to request his permission to visit him. Kinjaho is a very large town, built of mud, or yellow clay. Thick forest all round, and very high trees. The people appear to be well off. Every house has its yard, apparently well stocked. Bullocks are plentiful. I do not enter into further details of my rumblings at present, because my journey down here will, of course, be repeated."

"Cape Coast Castle, November 1, 1858.

"Kinjaho, the capital of Assinie, is the terminus of one of those great caravan roads which intersect Central Africa (West). Unfortunately, it was closed to me, because it passes through a narrow strip of Ashanti territory, only four days' journey across; and I know very well that no Ashanti chief would dare to allow a white man to pass through his town. He would detain him there till the will of the king respecting the traveller had been made known; and the will of the king would undoubtedly be that the white man should be brought to Coomassie. It is worth knowing, however, that Kinjaho is the first station—the first gate of the interior—in this part of Africa; for I believe that the whole of the Kroo coast is a dead wall, and that the sea-coast tribes do not communicate with those who are beyond the mountains. This, however, is only from hearsay.

"This information simplified my future proceedings. I found that my bow had no second string. On arriving at Kinjaho I had a meeting with Amatifoo and the Ashanti chiefs. The manners of Amatifoo on the first occasion had

been exceedingly dignified, and indeed haughty, though courteous. This time there was something deprecatory and apologetic about him, the reason of which I at once suspected, and it has been confirmed to me since I began to write this letter. I said the time necessary for a messenger to go to Coomassie and to return had elapsed. The king said that he had not returned; it was not his fault, he would soon come; I must wait a little longer. I said that if it depended upon myself I would wait with pleasure; but I had been sent to visit the interior, and if I could not do so from Assinie I must go to another part of Africa, in which case King Amatifoo would lose the very handsome present which I had prepared for him, and that I should deeply regret. I perfectly understood that he could not pass me through Ashanti: that was not his palaver; but he could pass me through his territory, and, if he felt inclined to do so, I would start at once, and wait for the answer of the King of Ashanti at the frontier (a considerable distance from Kinjabo). Amatifoo said he would give me an interpreter, but said his men did not understand hammock-bearing, &c. &c. . . . I parted with Amatifoo the next day on very good terms, told him that I would let him know my decision in a few days, and said that as the King of Ashanti was evidently just going to war he would be too busy to receive a visitor, and that I thought it would be better for me to come back after the war was over. On arriving at Assinie I prepared a letter for the King of Ashanti, in which I said that hearing he was going to war I would postpone my visit till it was over. This I gave to some of Amatifoo's agents who were down at the sea-side, made them some trifling presents, told them that a friend of mine, Captain Howe, was coming with clothes similar to mine which they so much admired and wished to buy, and that he would probably make a house, which seemed to please them very much.

"Such was the state of affairs when I addressed to you my last letter. I was completely a prisoner at Assinie, and I could foresee no definite period at which I could escape. To go again by land with all my effects was out of the question. On the 3rd of October I went to Grand Bassam, where I was hospitably entertained at the French factory during a fortnight. When the Admiral returned from the lagoon, I presented myself to him, and he said that he was going to Cape Coast and would put me down there. This relieved my mind, though I did not feel quite safe till I had got on board the frigate. The Admiral was detained a week at Grand Bassam by the bar of the river, which he had to cross in a small steamer. Then he went to Assinie, inspected the troops (numbering 18 soldiers), and then started for Cape Coast. He went into Elmina, where I landed, and walked over here the same afternoon a week ago. It is the only fortunate circumstance which has occurred to me hitherto that I was able to come down here with all my heavy baggage, without loss of time or money. I found the Ashanti messengers here, sent by the king to threaten war against the Fantia, unless certain terms were complied with. Since beginning this letter, Palmer has seen the Ashanti sword-bearer, who left Coomassie forty days ago. *Up to that time no messenger had been received from Assinie respecting the visit of a white man.* Whether this is owing to false faith on the part of Amatifoo, or to the negro spirit of procrastination, I do not know; but it seems to me to be beyond the limits of the latter, and that commercial jealousy is the cause of Amatifoo's conduct. I did all that man could do to guard against this, the risk of which I fully foresaw. I expressly told him that I was forbidden to trade, and promised him a handsome present if I did go to Coomassie; promising also that the sooner I started the better the present would be. I have at least the satisfaction now of knowing that I did well in not wasting any more time at Assinie; and, having waited about thirteen weeks for an answer which could have been returned in five or six weeks, cannot be blamed by any one for having precipitately given up an undertaking which I had begun.

*I will now say a few words about Assinie and Grand Bassam. If you refer to the map, you will see that the river is to leeward of Grand Bassam. The settlements are all on the windward side. There is, however, a native village on the leeward side; and I was informed that a factory would do as well, or even better, on that side, as it would monopolise the trade of that village. The town of Grand Bassam is situated a couple of miles or so up the river,—a circumstance which should be carefully borne in mind. It consists of one street about half a mile in length; houses of swish and thatch, with yards; in fact, the regular Gold Coast house.

"The settlements consist of a *maison mofide*, and several barracoons shaded by cocoa-nut trees, on a bed of sand, enclosed by a stockade square, with a bastion at each corner, close to the river. Fifty yards to the west is the French factory, so called. It is really, however, a Dutch firm. To the north is a small village, inhabited by those who get their living out of the *Poete* and the factory; and then you come to the lagoon which runs from the Grand Bassam River to beyond Tack-Tack. The village of the soldiers is situated to the north of the *Poete*, on the water's edge. Grand Bassam is, to all intents and purposes, an island. One can walk along the beach to Tack-Tack, but, as a matter of fact, one is obliged to take to water whenever one wants to go anywhere. To go to Assinie you must cross the river. If you go to Tack-Tack or to Dabon, a French blockhouse close to Tack-Tack, on the opposite side of the lagoon, it is by water. The lagoon is extensive, and the river goes a long way into the interior. How far, indeed, I only learnt from a Bantooko man, whom I questioned here; but the jealous spirit of the natives would render exploration from that point hazardous, if not impossible. I want to Grand Bassam (native town) with the view to making inquiries; for, could I have seen my way in, I would decidedly have gone.

"The River Assinie is, I regret to say, undeserving of geographical attention. The rapids are a short distance beyond Kinjabo, above which it is not navigable by canoes. The River Tanoe runs parallel with the sea behind Apollonia, but is not, I believe, of any importance."

"S. S. Mandingo, Dec. 4, 1859.

"From news which I have had of Cape Coast since I left there, it would seem that there is little probability of the Fanti and Elmina palaver being settled. The coast between Assinie and Cape Coast Castle is not very interesting. Apollonia is the first large town; it is chiefly of wood. The Dutch have just finished a small fort (lime can easily be obtained), which does not look as if they meant to part with their possessions. Behind the town is a large plain, or rather marsh, except in the dry months, with clumps of trees; then the forest, behind which is said to be the River Tanoe, which in the rainy season inundates the intervening country. I stopped there, at the house of a man named John. From Apollonia to Axim is a hard day's journey. An estuary lately opened by the sea, and a river, have to be crossed. The ferry charge is a piece of komalo. On the left bank of the Ancobra or Axim River the aspect of the country begins to change: from flat it becomes hilly. Axim itself is built neatly of swish, and has a very fine stone fort. From Axim to Dirhoo (as I dare say you know) the road is circuitous, owing to the Three Points, and the traveller has to walk a great part of the way. I was delighted with the aspect of Elmina; it was the first European settlement on the coast, and is, therefore, historical. It is exceedingly pretty, and the fort is the finest on the coast. What struck me as the most remarkable in this journey was the perfect organisation of travel. Regular charges, no obstructions from the natives or palavers with them; everything just the same as in a civilised country. Arriving at Axim one night at 10 o'clock, I was able to hire a gang of hammock-men and pay them their subsistence in half-an-hour, and started the

first thing the next morning. But the population along the whole Gold Coast appears to me to be very scanty compared with that of the Slave Coast; and there is this great difference: the Yorubas, Egbas, and Popoo appear to mass into large towns, while the Ashantis and Fanti are villagers, especially the former. Along the beach the villages are certainly numerous, but then they are often simply clusters of huts. The system of markets, or rather fairs, too, as practised by the Yorubas, &c., appears to be unknown on the Gold Coast."

" December, 1868.

"In my last report I spoke briefly of the Dutch Gold Coast, which I twice travelled along, the first time chiefly by canoe (beginning at Axim); the second time entirely by land, except that portion of it which lies between Elmina and Chama, where the road is completely stopped on account of the command in trouble. I shall now pass on to my visit to Akropong.

"While staying at Cape Coast with Mr. Cleaver the Governor-in-Chief arrived, and during our first interview hinted that he would be glad to give me the charge of an expedition into the interior from the Sherbro River, with a view to examine the resources of that country, and also to discover the sources of the Niger if possible. This offer being conditional on the consent of his council, who vote the supplies, I told him that I had in view a journey from Accra to the Danke country (as the interior of the country is inaccurately called) lying between Ashanti and Dahomey to the back of Crupea; so it was agreed that it should lay in abeyance. In the mean time a letter from Dr. Gunnell induced Mr. Cleaver to ask me to go to Whydah, which I agreed to do. The Governor-in-Chief gave me a passage to Accra in H.R.M. ship *Lee*, and thus, having three days to spare, I was enabled to make a trip to Akropong before the arrival of the *Mendiaga*. Governor Glover arrived at Accra also at this time, and I found from him that the country interior from Lagos was too much troubled to admit of a journey being made from that settlement with a fair prospect of success; and the missionaries at Akropong informed me that I could not be sure of getting through the Volta country on account of the war. On my return from Akropong I told Sir Arthur Kennedy that I would go to Sierra Leone (as he informed me that the interior was open there), relying upon receiving much help and countenance from him which he could give me as Governor.

"I started from Accra about 7:30 A.M. with hammock, accompanied by my interpreter, Palmer, whom, of course, I had discharged. Our way lay over a very beautiful undulating plain thickly studded with trees, and clothed with grass, sometimes towering high above our heads. The Aquapino Hills could be seen blue and misty in the distance. We passed a few small villages built of awiah, sometimes containing a room for weaving cotton (Knupee is the country for that), and almost always a blacksmith's forge. At half-past twelve or one we entered one of these villages, and a girl passing by, dressed in a blue check cotton frock, announced that a mission station was close by, and I soon saw their large shingle roof. Taken up to the house of the principal, I was received by him and his wife with great cordiality, although I had no letters. It is situated near the Aquapino Hills, and is the head-quarters of the (supposed) twise, a specimen of which I sent in my last letter. We now travelled on through an underwood thick and fragrant till we came to the bottom of the hill, where I dismounted. The road is stony, but tolerably broad; the missionaries have spent some money on it. The trees began to increase in size; and beetles, like burnished gems, made their appearance on the leaves on the road-side. I went along leisurely, walking a good deal, so that we arrived at Aborrie at dusk. This is also an educational establishment for girls. The difference in height between this place and Akropong is inconsiderable; the latter is a trifle higher. Akropona is in the Accra country; Aborrie is in

the Aquapino country. The language of the first is Ga; that of the latter Otchi (of which Ashanti is a dialect); they are therefore quite different. Although Akropong is the capital (king's residence) of Aquapino, Aburris is the larger town. It numbers, I think, about 1000 guns, representing so many able-bodied men. Here I met one of the former-missionaries from Christianbourg. We had a chat about the ofroi-fly, which had killed ten horses for him. But two donkeys he had bought up-hill had also died, and the tsetae, according to Livingstone, does not touch donkeys, or their congeners, men. I was stung by one of them; it was merely like that of our common horse-fly. The next morning I went to Akropong, and was kindly received by Mr. Mader, the head missionary, who gave me a room. The aspect of the large neatly-built schools and houses, with a 'quad' in their midst, turfed with Bermuda grass; the coolness of the air, the beautiful view of the Accra plain, reminding me of the valleys of the Arno and the Rhine, the sound of the harmonium, and the sight of two noisy vivacious little children, made me almost fancy myself in Europe. It was indeed very different from anything which I had seen in Africa, and I regretted very much that I had only one day to spend there. At Akropong there is a boarding-school for small boys, about 80; also a grammar-school and a theological seminary: the two latter with admirable sleeping-rooms and neat clean beds, quite a pleasure to look at. The system of education I do not approve of; it is a great deal too classical—just the system which is being so generally attacked in our own country at the present day. Akropong is now used as a sanatorium by the Christianbourg missionaries, and also by many merchants and officials (who do not wish to leave their posts). It is by no means a perfect sanatorium. About 1500 feet high, and in a dense forest, it is not exempt from malarious influences, but still the air is cool and refreshing.

"The Aquapino people are peaceful and industrious. The kola-tree appears to be abundant, but the nuts are not collected. No cotton can be grown, on account of the thickness of the forest. The coffee-plantation may be considered a success, and that berry will be exported in large quantities in the next generation. The plain between the hills and Accra would grow cotton well enough, for I observed it growing wild. There are ferruginous springs in the neighbourhood. Some of the trees are of prodigious height, running up 200 feet without a branch. The great want of Akropong is means for portage. There is no river. Everything has to go down to Accra on women's heads. Were it not for the fly, or whatever it is which kills horses and cattle, the missionaries would, I think, have horse and bullock-waggons at work. But that is unhappily impossible. These Bantu missionaries, by-the-by, do not receive any salary, only an allowance of about 150s. This they may not exceed, and if they save anything it goes into the chest. They would not take anything from me, as I was there only a day; but for regular periods they charge, I think, a dollar a day. I was at Akropong only a day and a half; fearing the *Mandingo* might be a day too soon, I made my preparations accordingly, and went from Akropong to Accra in the day, arriving at 6.30—a very good journey."

4. *Letter from Sir A. E. Kennedy, Governor of the West African Possessions, on recent Explorations near Sierra Leone.*

"MY DEAR SIR,

"Government House, Sierra Leone, April, 15, 1869.

"I have received your letter of the 8th March, 1869, thanking me on the part of the Council of the Royal Geographical Society for the aid I have been able to give Mr. W. Winwood Reade.

"I am painfully conscious how little I deserve this recognition of the little I have done.

"It is a matter of great commercial importance to this settlement to have the road open to the Niger, in the Sangha country, and Mr. Beade has nearly accomplished this, having reached as far as Palaba, capital of the Soelima country; and if he gets no further, I have made arrangement this very day with the son of a chief who will guarantee the safety of any one I may send next dry season. This young man describes the whole route as easy, about a month's journey, plenty of horses, country fine and salubrious, and people industrious and most anxious to be visited by white men.

"In enclose copy of Mr. Beade's last note, in case you are without information.

"I am doing very little towards letting in daylight upon West Africa, where our trade is becoming more extensive and valuable daily. I myself came to this coast in the first mail or commercial steamer (the *Forerunner*) which ever came to West Africa, and there are now four first-class steamers per month running out and home full of cargo. I see no limit to the development of trade on this coast, if we can extend our influence and maintain peace in the interior. You are probably aware that, having crossed the bar and ascended the hitherto inaccessible river Volta this year, with the very valuable aid of Captain Glover, R.N., and a little colonial steamer, we remained in the river for 14 days, and made a survey of the bar and entrance. It is a grand stream, free from mud and swamp, and opening a rich and valuable country.

"I shall always be glad to receive any suggestion you will be kind enough to offer me in forwarding the view of your Society.

"I am, my dear Sir, your very faithful servant,

"A. E. KENNEDY.

"Sir Roderick Murchison, Bart."

5. *Note on the Determination of Heights, chiefly in the Interior of Continents, from Observations of Atmospheric Pressure.* By ALEXANDER BUCHAN, M.A.

(Extracted from the Proceedings of the Royal Society of Edinburgh, 1868-9).

THE weight or pressure of the atmosphere is ascertained by the mercurial barometer, the aneroid, or from the temperature of the boiling-point of water. The height of a hill is measured barometrically, from observations made simultaneously at its base and top, and the application of certain well-known formulae. The height of a place at no great distance from another place whose height is known, and at which observations are made about the same time, may similarly be ascertained with a close approximation to the truth.

But with regard to places far from any place of known elevation, or from any place at which meteorological observations are made, it is plain that the height can only be computed by assuming a certain pressure as the sea-level pressure at that place.

In the Table giving the reductions of heights from Captain Speke's observations, it is stated ('*Journal of the Royal Geographical Society*,' vol. xxiii.), that a mean pressure of 29.92 inches was assumed as the mean sea-level pressure,—that is, if those parts of Africa visited by Speke had been on the same level with the sea, it is assumed that the mean pressure of the atmosphere would have been 29.92 inches.

In the last revised '*Hints to Travellers*,' prepared by the Royal Geographical Society, and published in the '*Journal*,' vol. xxxiv., it is stated at page

286, "When the boiling-point at the upper station alone is observed, we may assume 30·0 inches, or a little less, as the average height of the barometer at the level of the sea. The altitude of the upper station is then at once approximately obtained from the tables." So far as I have been able to ascertain, this mean height of the barometer has been generally accepted by travellers as applicable to all seasons, and to all parts of the globe at great distances from Meteorological Observatories. Unfortunately, it has hitherto been generally the practice for travellers, or those who have been intrusted with reducing their observations, to give only the heights deduced from the observations, with a curious minuteness of accuracy, and not the observations themselves. Since the tables which have been prepared for travellers are calculated on the assumption that 29·92 inches, or 30·0 inches, is the zero point for heights, there can be little doubt that, by this method, the heights of many plateaux and mountains of the globe have thus been determined.

From my paper, read before this Society in March, 1868, on the "Mean Pressure of the Atmosphere over the Globe," illustrated with three charts, showing the *Mean Isobaric Curves* for July, January, and the year, it may be seen that a pressure of from 29·9 to 30·0 inches is very near the mean annual pressure over the greater part of the globe, particularly over those portions of it explored by travellers. But when we examine the months, it is at once apparent that 29·9 inches is very far from the mean pressure in many regions. This point will be illustrated by the pressures at Barnaul, Siberia, which on average of 19 years are reduced to 32° and sea-level, as follows:—

Mean atmospheric pressure at Barnaul in July				Inches.
"	"	"	January	30·293
"	"	"	Year	29·954

Suppose, now, it be proposed to ascertain the height of Lake Balkash on some day in July, the pressure at the time being the average of the month. Let the observed pressure be 28·8 inches reduced to 32° Fahr., and the temperature of the air be 70°·0, then if the sea-level pressure be assumed to be 29·9 inches, it is plain that the difference due to height is 1·10 inch; in other words, the height of the lake would be, in round numbers, 1080 feet. But since the sea-level pressure of this locality, which is nearly that of Barnaul, is 29·536 inches, the difference of pressure due to height is only 0·736 inch; the height, therefore, is only about 730 feet. Again, if in January, when the barometer is the mean of the month, the pressure at Lake Balkash was observed to be 28·42 inches, and the temperature of the air 1·0°, assuming that 29·9 inches is the mean sea-level pressure of January, 0·48 inch is the difference of pressure due to height—that is, the lake is about 400 feet above the sea. But since the mean pressure is nearly 30·3 inches, 0·28 inch is the pressure due to height; the lake is therefore nearly 130 feet above the sea. Thus in July the lake would be made 550 feet too high, and in January 330 feet too low—the difference of the two observations, each being here supposed to be taken under the most favourable circumstances, and with the greatest accuracy, being 680 feet.* Observations made in the first half of April, or in the latter half of October, when the pressure is the mean of the year, supply the best data for the calculation of heights.

If the best physical atlases be examined, and the heights, given by different authorities, of table-lands and mountains, of Central Asia, Central Africa, and

* The height of Lake Balkash, according to the Russian explorers Semenov and Golubeff, may be anywhere between 530 feet as given by the former, and 1200 feet as given by the latter. For a large number of heights made use of in writing this note, the author is indebted to Mr. Keith Johnston, jun.

the highlands of the United States and British America be compared, considerable confusion will be found to prevail.

One or two examples may be given to show the application of all this. From barometric observations made on the 28th November, 1838, the level of the Dead Sea below that of the Mediterranean was calculated to be 1429 feet. The real depth of this sea below the level of the Mediterranean, as determined by the English engineers by levelling, is 1296 feet. Now, since the mean pressure of the atmosphere over the region of the Dead Sea in the end of November is about 30·035 inches, it is seen, if the sea-level pressure was assumed to be 29·9 inches, how the lake came to be lowered 133 feet.

Much interest is at present attached to the heights of Central Africa. The following mean pressures at 32°, and sea-level, bear on this interesting question:—

	January. Inches.	July. Inches.		January. Inches.	July. Inches.
Malta	30·07	30·01	Cape Town ..	29·97	30·20
Algiers	30·15	30·06	Graff Reinet ..	29·91	30·22
Laghouat (Algeria)	30·07	29·86	Maritzburg ..	29·89	30·19
Gibraltar	30·18	30·06	Mauritius ..	29·95	30·19
Christiansburg ..	29·92	30·04	Aden	30·03	29·69
St. Helena	30·05	30·18	Alexandria ..	30·06	29·80
Grahamstown ..	29·91	30·15			

Thus the difference at Graff Reinet and Maritzburg between the January and July pressures amounts to about 0·30 inch. From this it may be inferred that, in calculating heights along the Zambesi, from observations made at different seasons, if no allowance be made for the monthly variation, but if 29·92 inches be assumed as the height for all seasons, the results from observations made in January will differ from 250 to 300 feet from those obtained from observations made in July at the same place. If no account be taken of the daily variation of the pressure, the observations made in July at 9 A.M. will give a difference of from 550 to 400 feet in height, as compared with results from observations made in July at 4 P.M. All this large error is avoided when the monthly and the daily variations are allowed for.

It has been seen that the summer pressure in Central Asia falls in July to about 29·50 inches. It might be inferred by analogy that the pressure in Central Africa also falls considerably below 29·92 inches over those regions where the sun is nearly vertical; and, as a consequence, that this space of low pressure moves north and south with the sun, attaining its northern limit in July, and its southern in January. The figures in the Table given above fully bear out this supposition. Thus, in July at Algiers, the mean pressure is 30·06; but at Laghouat, between 280 and 300 miles inland, the pressure is only about 29·86 inches; at Alexandria it is 29·80; and at Aden, only 29·69; and since, in the same month, according to Speke, the wind in Central Africa near the equator and long. 32° 20' E. is almost constantly south-east, it is probable that the pressure there is lower than at Aden. Taking the whole facts into consideration, it can scarcely be less than 29·70 inches, though probably it is lower. Again, in January the pressure at Cape Town being 29·97 inches, at Graff Reinet 29·91 inches, and at Maritzburg 29·89 inches, points still further to a diminution of pressure in the centre of Southern Africa at this season, increasing from the coast—falling, probably to between 29·70 and 29·80 inches. Hence, if we assume 29·70 inches as the low pressure which accompanies the sun over those parts of Africa where he is nearly vertical, we shall not be far from the truth.

Let us apply this reasoning to the determination of the height of Albert Nyanza from Sir Samuel W. Baker's observations of the boiling-point of water. The observation was made in lat. 1° 14' N., long. 30° 50' E., on 14th March,

1864, between 8 and 10 A.M., probably at 9 A.M. The boiling-point of the thermometer was 207°C ; but as it changed while in Sir Samuel Baker's possession, it is supposed that the true reading was about 207°F , which corresponds to a pressure of 27.231 inches.* But since the observation was made about 9 A.M., when the pressure is about the maximum of the day, subtracting .043 inch as the correction for daily range in July, we obtain as the mean pressure of the day 27.188 inches. If we assume the sea-level pressure to be 29.70 inches, the difference due to difference of height will be 2.512 inches, and the temperature of the air being at the time 84°F , the height of Albert Nyanza will be in round numbers about 2550 feet, or considerably under the height usually given.

Similarly, by the same reasoning, Gondokoro, calculated from Sir Samuel W. Baker's observations to be 1990 feet in height, will be only about 1800 feet above the level of the sea.

Considering the small difference within the tropics in the mean pressure of any month, say July, from year to year, it follows that if recent African travellers had been provided with good thermometers for determining the boiling-point of water, and had made carefully conducted observations with them, noting the precise hour and month of the observations, one of the great problems of African travel would have been already solved, viz., whether Lake Tanganyika does or does not flow into Albert Nyanza, unless the difference of level between these two lakes is comparatively small. But since travellers have been given to understand that the heights deduced from their observations may be in error to the extent of from 300 to 500 feet, less care has been bestowed in making such observations than would otherwise have been the case.

In extra-tropical regions the height of the barometer is much more fluctuating, and the pressure during any month from year to year varies more than within the tropics. But even in these regions the limits of error are much less than are usually supposed, if care be taken to make the observations full and precise, so that when they come to be reduced it may be in the power of the meteorologist to value them at their proper worth. This remark may require a little explanation.

In temperate regions barometric fluctuations are more frequent and of greater amplitude in such countries as Great Britain, which are situated between a continent on the one hand and an ocean on the other, than in the interior of continents in the same latitudes. Now, since it is to the interior of continents, viz., Asia, Africa, North and South America, and Australia, that these remarks on the discounting of heights are intended to apply, the limits of error of single observations, or groups of observations, of the pressure of the atmosphere, are much less than one accustomed to observe barometric fluctuations in Great Britain might be led to suppose. Hence, if the mean monthly sea-level pressure of the part of the earth's surface where the observation is made be kept in mind, the difference between this pressure and the observed pressure will be a tolerable approximation to the true difference of pressure due to the elevation of the place.

But a still closer approximation may be reached. All examination of weather on a large scale shows, in the most conclusive manner, that barometric fluctuations are always attended with changes of weather of a well-marked and determinate character. Hence, conversely, if travellers kept a careful record of the weather some time before and some time after they made their observations of the pressure of the atmosphere, some idea could be formed as to whether the observed pressure was above or below the mean pressure of the season at the place.

* Regnault's Tables, revised by Moritz.

Thus, suppose that for some time before and after the observation the weather was fine and of a steady character throughout, the nights not much colder and the days not much hotter than usual, the winds light, or if moderate, continuing in one direction, and the state of the sky with respect to cloud much the same from day to day, it might be assumed that the pressure was the average of the season. Observations carefully made under these conditions are entitled to be ranked in the first class, as being the most trustworthy that can be obtained.

But if the nights have been for a day or two colder, the days hotter (in the sun), the air drier, and the winds lighter, and calm weather more prevalent than usual, then it is probable that the pressure at the time of observation was above the average of the season.

Again, suppose, in the north temperate zone, the air to have become warmer and moister, the sky clouded, rain to have fallen, and the wind veered from E. or S.E., by S. and S.W. to N.W., or suddenly shifted to W. or N.W., and the weather then to have become colder and clearer and the air drier, it is certain that a storm of greater or less magnitude has passed over the region, and since such storms are attended with great fluctuations of the barometer, it is plain that if the observation of pressure was made during these changes, it is worse than useless as a datum for the determination of the height of the place. It should, therefore, be altogether rejected.

These cases are given as examples of the method by which observations, as made by travellers, should be critically examined before they are made use of in calculating heights. It is probably from inattention to these simple directions—travellers not recording the required data, which can all be recorded without instruments, and computers not giving weight to such observations when recorded—that a large number of the grosser discrepancies, given in works of Physical Geography, have arisen. Many of the larger errors are, of course, due to the use of imperfect instruments and a want of practice in the observer.

An illustration of errors in the statement of heights may be given. The following places are situated in the neighbourhood of the Ural Mountains; the heights are those given by the most recent authorities, and a column is given showing the number of years for which the averages of mean annual pressure have been calculated:—

Place.	Lat. N.	Long. E.	Height in Feet.	Years of Average.	Mean Pressure at 32° and Sea-level.
	° ' "	° ' "			Inches.
Bogoslovsk	59 45	60 2	600	26	29.862
Nijni-Tagilsk	57 57	59 53	730	21	30.088
Catherinenburg	56 49	60 55	800	18	29.835
Zlatoust	55 10	59 40	1200	28	29.835

From the above annual mean pressures it is evident that the height of Nijni-Tagilsk is over-stated, the true height being probably about 250 feet less than what has hitherto been assigned to it.

Since it has, unfortunately, been the general practice not to publish the original observations, but only the heights deduced from them, it will be impossible, except in a comparatively small number of instances, to apply the principle brought forward in this paper to past observations.

Observations for the ascertaining of heights must, to be satisfactory, include the following particulars:—

1. Latitude and longitude of the place.
2. The date of the observation, giving exactly the year, the month, the day of the month, and the hour of the day.
3. The observation itself exactly as made; if with a barometer or aneroid, the pressure to be given; if with a thermometer, the boiling-point to be given, and not merely its equivalent in pressure.
4. The temperature of the air in shade.
5. The weather for two days before and after the observation, showing the temperature of the air, its probable humidity as made known by the feelings or by its effects on surrounding objects, the amount of cloud, the rainfall, the direction, veerings, shifts, and force of the wind, together with any striking phenomena that may occur.

To these might be added, if possible, observations of the wet-bulb thermometer.

It will be evident from these remarks that the physical geographer will require the practised meteorologist to aid him in settling the important physical problem of heights for large portions of the earth's surface.

6.—*Eastern Siberia and the Amoor.* By RONALD BRIDGETT, Esq.

The following pages are written from personal observation and information derived on the spot during the autumn of last year.

Commencing with the most eastern portion of the vast Empire of Russia, we find the Pacific seaboard organised in 1858 as a separate Provincial Government, under the style of the Maritime Province of Eastern Siberia, and extending from the Corea in the south to Behring's Straits in the north, while inland it reaches Khabarovka on the Amoor in long. 155° E. The existing settlements in the south are at Posiet Harbour and Vladivostock (Port May), both forming capital anchorage, and the latter destined, ere long, to become the chief naval depôt of Russia in the Pacific, as the navigation is closed by ice for only two months in the year, while Nicolaievsk, the present rendezvous of the fleet, is difficult of approach, and frozen up far more than six months. The coast line of Manchuria is very mountainous, but inland towards the Lake Kinka and River Ussouri exist tracts of land capable of producing rich crops of grain. From Vladivostock a telegraph line exists by way of the Rivers Ussouri and Amour to the head-quarters at Nicolaievsk. Large game exists in numbers, and it is not uncommon to see three or four tigers at one time. A small station likewise exists at Port Imperial or Barracouts Bay in lat. 49° N. On the opposite side of the Gulf of Tartary, on the Island of Saghalien, Russia maintains one or two military posts, the one to the south was situated at Kussonei in lat. 48½° N., and regarded as the Japanese frontier, but by a mutual understanding with the Japanese for the interchange of colonists, the Russians last summer made a commencement by sending down to Amik Bay on La Perouse Strait a battery of artillery and a company of soldiers! A Russian post formerly existed at this place, but was withdrawn. The other station on Saghalien is at Doni, in lat. 50½° N., three miles south of Jonquiere Bay, nestling in a gap in the mountains, and not distinguishable from the sea, except by the lighthouse built on the hill above. It consists only of a few log huts and barracks for the soldiers employed to guard about 70 convicts of the worst class, murderers and others who are looked upon as beyond the pale of the law, and not subject to the same restrictions as regards personal chastisement as other criminals, four to five hundred lashes being the punishment awarded for a trivial offence. Here, as in other parts of Saghalien, coal is found on the surface, and the seams may readily be traced on the

face of the cliffs. The convicts are employed in working the coal and bringing it to the jetty for shipment. It is used by the Russian steamers navigating these waters, and was favourably reported on by the engineer of H.M.S. *Scylla* in 1869. The lumps are small, but crumble to pieces when exposed to the air, and its chief fault is said to be its mixture with dirt. Last year two vessels loaded cargoes for China. Very good sable-skins may be had here for ten roubles, or for a bottle of Hamburg brandy worth one rouble, which shows the little value of money.

A little to the north of Doui, on the mainland, is De Castries Bay, which is well protected by pine-covered hills, and offers capital anchorage for vessels of the largest class from May to November when not covered by ice. Vessels drawing more than twelve feet of water usually lighten here before proceeding to Nicolaievsk. It was here that, in 1855, the Russian squadron found shelter after the evacuation of Petropavlovsk, but during a dense fog contrived to give Commodore Elliot the slip, while he was waiting outside for reinforcements. The post is occupied by about 200 soldiers living in log huts, and the remains of earthworks and fascines formed in 1855 are still visible. From De Castries Bay, proceeding north along the Liman and following a tortuous channel marked out by lumps, &c., the mouth of the River Amoor is reached. Twenty miles up the river, on the left bank, is situated the town of Nicolaievsk, consisting of wooden houses whose shingle roofs, coloured red and green, look picturesque in the sunshine. It is the head-quarters of the Russian navy in the Pacific, and as such the approach from the sea is defended by batteries. In 1854 there were only ten log huts, but now the population numbers upwards of 5000, consisting chiefly of military and convicts. There is a public garden where the regimental band plays on Sunday afternoons in summer, and also a public library and reading room—supplied with the principal European journals—and a club house, where during the writer's visit an excellent amateur concert was given for a charitable purpose, and, showing how Western refinement has extended even to this distant part of the globe; each lady was presented with a programme printed on white satin. The trade of the port, though free of all customs dues, is of no great extent, and consists mainly of imports from Hamburg and San Francisco, which arrive in six or eight vessels between May and October, and failing any exports but furs, the ships have to go away in ballast. In winter the cold is very severe, and all navigation ceases from November to May. The river at Nicolaievsk is about a mile across, and in summer is navigable for steamers of light draught a distance of 2000 miles from its mouth. At present ten or a dozen steamers are employed in Government service, transporting mails, passengers, and merchandize; in addition to these there are three or four private steamers. In winter communication is kept up along the frozen stream by post stations, at which horses and sledges are kept, and last year a Government courier made the journey to St. Petersburg, a distance of 6000 miles, in 30 days; but this is quite exceptional, as the winter post usually occupies 45 to 50 days.

Ascending the river in a steamer, and anchoring each night, Mariensk is reached in a couple of days; this was first occupied as a trading post in 1851, but Sofiensk, 20 miles higher up, is now preferred, and is occupied by a number of soldiers, whose barracks, a large house occupied by the Telegraph Administration, and a few scattered log-huts, constitute the settlement. From this place to De Castries Bay there is land-communication, the distance being only some 30 miles. Between Nicolaievsk and Sofiensk the river-banks are hilly, but in places they recede and long low islands abound. Three or four small Russian villages are passed, whose inhabitants cultivate a few patches of rye, oats, and vegetables. The latter, with milk and wild fruit, they dispose of to the steamers while stopping to wood. Both fires appear very frequent in this neighbourhood, and mosquitoes swarm in myriads.

From Sofiansk to Khabarofka, a distance of 460 miles, the river-banks are in places hilly and wooded, while at times the stream divides into numerous channels intersected by water-meadows, from which the villagers secure a winter store of hay. Khabarofka is of some importance as a military station, and is situated on a cliff at the junction of the River Ussuri, which falls in from the south. Along the right bank of this stream a line of Cossack posts protects the Russian boundary. The telegraph wires, which had hitherto followed the course of the stream, here diverge, and extend to Vladivostock on the coast, but in another year communication with Europe will be complete, as the work is being proceeded with.

Continuing our progress past the mouth of the River Sungari, a large tributary, and for several days between low banks and through uninteresting country, the character of the scene changes suddenly after passing the village of Ekaterin-Nicolaski, which, like others on this part of the river, and all on the left bank, consists of a line of log-huts facing the stream and occupied by Cossack soldiers and their families. The river here contracts to a quarter of a mile in width, and is hemmed in for a distance of 60 miles by lofty hills clothed from base to summit with mountain oak, white birch, and fir trees. This is known as the passage of the Hinghan or Bureya Mountains, and in places the current is so strong that it is with great difficulty that steamers can make progress. A more open country succeeds, with swelling woodland and park-like patches of grass, and, after passing several Manchour villages, the Chinese town of Aigun on the right bank is reached; but it offers no feature of interest, and, although of some size, consists only of wooden huts with mud walls, and a few joss houses or temples, while along the bank are ranged a dozen small brightly painted junks, constituting the Chinese fleet laid up in ordinary. Some 15 miles above Aigun, at the mouth of the River Dzeiya, is Blagoveshchensk, in long. 137 E., the residence of the Governor of the district of the Amoor, and the largest town on the river with the exception of Nicolaiavsk. It consists of two long streets, one of which faces the river, but the houses are rather far apart and irregular and all built of wood. The residence of the Governor is on one side of the Place d'Armes—of the future—as at present it is the resort of the stray pigs of the neighbourhood. A battalion of infantry is quartered here, and for the use of the soldiers a gymnasium has been erected, with the addition of appliances for practising the scaling of walls and earthworks, an example which might be followed with advantage in England. The country round is open moorland, and offers good pasturage for numerous cattle, which are sent down the river for sale on steamers or rafts. The chief trade of the place is conducted by the Manchours, who inhabit the village of Saghalien on the opposite bank, and return each night; like all Chinese they are good traders, but their exterior is very dirty. They bring flour, tea, tobacco, and bullocks for sale, and take payment in European goods, Mexican dollars and silver moulds, which are sent to Tatsiagar, a large town 100 miles to the south, there to be melted into “shoes” of silver, or Sycee.

On the River Dzeiya are several villages inhabited by peasants from Russia, belonging to religious sects not in communion with the Greek Church, who have been driven from their homes by persecution. The land they cultivate is very rich, and gives bountiful crops of grain, and the Government for the last two years has been a large purchaser for the supply of soldiers and others in less favoured districts on the Amoor.

Continuing our course up the Amoor we pass charmingly wooded hills rising from the water's edge, with here and there a bold rock to change the character of the scene. The stream is very tortuous, and in one place makes a circuit of 20 miles, and returns to within half-a-mile of the same spot. Wild geese and ducks are to be seen here in thousands, and afford excellent

sport, while bears and other large game may also be found in plenty. At 200 miles' distance from Blagoveshchensk a line of chalk cliffs are passed, known as the White Mountains, rising from the water's edge, and continuing for three miles. Beyond these, in three or four days, we come to Albazin, a large village distant halfway between Nicolaievsk and Stretensk. The church forms a prominent object, and is built on raised ground which was formerly a fort, and in the 18th century was successfully held by 300 Cossacks against an army of Chinese. The traces of numerous earthworks are still visible in the village and neighbourhood. At a distance of 80 miles to the north gold has been recently discovered, and is being worked at an extensive outlay by a capitalist of St. Petersburg, causing a large influx of miners and others last summer, and raising the prices of all provisions to an exorbitant rate. The gold is found in clayey soil after the removal from the surface of about 10 feet of black earth, and the produce is said to be very rich.

Some distance below Albazin a dangerous bar crosses the river, and in 1855 prevented the further ascent of the first Russian expedition up the river under the direction of Admiral Putiatin in the steam-launch *Nadeshda*. In the previous year General Mouraviev headed the first military expedition down the river, conveying reinforcements with supplies and provisions for the garrisons in the Pacific, which were closely blockaded by the Allied Squadron. In the autumn of 1855 a party of 400 soldiers returning from De Castries Bay, also ascended the river in barges, and a sad history is related in connection therewith. Becoming frozen up, and unable to proceed by water, the men were divided into parties, and those landing deposited stores of provisions, as at that time there were no settlements on the river. The quantities and distances were wrongly calculated, and the parties following found diminished supplies at each place, and were reduced to the most horrible state of starvation, and not one-fourth of the whole party survived. Those who returned to assist their fellows found corpses with the flesh of their dead comrades, which they had not the strength left to masticate, still remaining in their mouths. The matter was hushed up for some time, and the persons to blame failed to receive their merited punishment. The chief culprit, subsequently Governor of Blagoveshchensk, is since dead.

Leaving Albazin, and after reaching the junction of the rivers Argun and Shilka, which unite to form the Amoor, we ascend the Shilka, both banks become Russian territory, and the passage of the Little Hinggan Mountains commences. For 120 miles very grand scenery prevails, and the only habitations visible in the dense pine-forests are seven post stations, till the village of Gurlitz is reached, and here the mountains begin to recede, fewer trees are seen, and the country shows signs of extensive settlement as we now are in Trans-Baikalia. Passing the village of Shilka, once the smelting-place for the silver ore found in the neighbourhood, Stretensk on the right bank is reached, and here steam navigation ceases, owing to the shallowness of the stream, although for barges it is navigable as far as Chetah. Steamers from Nicolaievsk ascend in summer in from 20 to 35 days, and descend in one-third the time. The ice at Stretensk breaks up from the 10th to the 15th of April, and pleasant summer weather ensues till about the middle of October, when frost and snow once more begin. Three miles above Stretensk the Russian Government has established workshops, in charge of an Englishman, for the repair and construction of steamers and barges, affording profitable employment to a number of convicts.

The colonisation of the Amoor was commenced on an extensive scale in 1858 and 1859, but it was not till 1860 that the full possession of the country was confirmed by treaty with China. Since that time villages have been established at varying distances, from 20 to 100 miles apart, along the whole length of the stream, from Ust Strelka at the junction of the rivers Argun and Shilka, to

Nicolaievsk at its mouth. This colonisation is in a great measure military, and to a certain extent artificial, and was only maintained at first by a vast expenditure of money, as supplies of flour and grain had to be imported by sea from Europe; and even now, in the spring of each year, supplies are sent down the stream from Trans-Baikal for distribution to the military colonies. Matters, however, show an improvement, as the villages are beginning to be self-supporting, and from the neighbourhood of Blagoveshchensk large quantities of grain are now forwarded to other parts of the river. The progress is slow, and the great anticipations once formed have been materially reduced, as notwithstanding the inducements offered by Government, few peasants care to undertake so long a journey from Russia, often lasting a year or eighteen months; and Government has therefore mainly to rely upon soldiers, and time-expired convicts, who are scarcely likely to make good settlers.

The native inhabitants on the river, besides the Manchours and Chinese, are not numerous, and on the upper part consist of Orochons and Manyars, who wander from place to place, and live in birch-bark tents covered in winter with deer-skins. Below the River Sungari are the Goldi, who, like the Gilyacks at the mouth of the river, and along the coast, live in wooden huts clustered together, not deserving the name of villages. They are expert fishermen, and wear dresses made of fish-skin. With these latter tribes the bear is an animal looked upon with great reverence, and one is usually kept caged in each village till, on a certain day in the year, a great festival is held, and he is slaughtered and eaten with due ceremony.

Returning to Strétnak, where the post-road extending into Russia commences, we thence reach Nerchinsk, a straggling wooden town, without a tree visible in the neighbourhood, and once the head-quarters of gold-mining, but having become exhausted, the mines are now worked more to the south and east. Following the course of the River Ingda, the road passes through a wild mountainous country to the town of Chetah, the capital of the province of Trans-Baikal, and residence of the governor. It is a place of about 5000 inhabitants, and has increased very rapidly, as in 1855 it numbered only about 100 houses. There is a Government College, and among the students are several young Bouryats, who display great aptitude for acquiring modern languages. The Bouryats are the native inhabitants of this part of Siberia, and have the Mongolian type of features; the women wear their hair in two long plaits brought forward over each shoulder, and the men have short pig-tails. Many of the men act as drivers at the post-stations, but, as a body, they are nomadic in their habits, and possessed of large herds of cattle and flocks of sheep, which find excellent pasture in summer on the steppes. For want of an outlet, the wool is often left to rot on the backs of the sheep, but the merchants at Kiachta are now buying it where they can, and despatching it down the River Amoor for shipment at Nicolaievsk. At a village 20 miles from Chetah are located some 2000 Polish exiles, a number of whom, while at work in 1886 on a new road at the foot of the Lake Baikal, made their escape, but while disputing as to leadership were surrounded by troops and once more placed under surveillance.

After leaving Chetah the road crosses the Yablonsi range of mountains, and traversing the Bouryat Steppe we arrive at Veshni Oudinsk, a considerable town at the junction of the Rivers Ondah and Selingur. On the latter a steamer was plying for the first time last summer, bringing tea from Kiachta on the Chinese frontier to the Lake Baikal. The bulk of this overland trade is, however, carried on, according to the season, by one-horse carts or sledges, which travel fifty or sixty together in single file, and occupy from five to six months on the journey into Russia. Veshni Oudinsk is in telegraphic communication with St. Petersburg, and distant 70 miles by road from the village of Paouk on the eastern shore of Lake Baikal. This lake, although frozen in

winter, is quite an inland sea, and at times when there is a strong wind the steamer, a stout boat of 250 tons, belonging to the merchants of Irkutsk, which usually makes the passage twice a week in summer, is unable to cross. Indeed the storms on the lake rage so furiously, as to given rise to a Russian saying, that "it is only on the Lake Balkal, in the month of October, that a man learns to pray from the bottom of his heart." At Pasolsk is a monastery, established in the seventeenth century, when this was the frontier, and on more than one occasion ambassadors were sent here by the Russians to treat with the neighbouring tribes. The passage of the lake usually occupies nine to ten hours, and on the west side dark cliffs rise from the water's edge and present a very grand appearance. It was only to this lake that the great traveller Atkinson went, though the title of his book on the River Amoor would have led one to suppose otherwise.

Quitting the lake the road for 40 miles follows the course of the River Angara, which finds its way out of the lake through an opening in the mountains, and we arrive at Irkutsk, the capital of Siberia, and a town of great importance. Viewed from the elevated ground where the cemetery lies, the town, covering a very extended area, has quite a gay appearance, as the roofs of the houses are red, while the domes and spires of more than a dozen churches are coloured green or white. The streets are wide, with many good shops, and although the houses are mostly constructed of wood, they contain all the comforts and luxuries of Western civilisation, as many of the residents are here against their own will. *Droshkys* ply for hire, as in Moscow and St. Petersburg, and, as most erroneous notions appear prevalent in England respecting Siberia, we may add, that ladies may be seen shopping attired in the latest Paris fashions, the most remarkable of which to a person arriving from the East appeared to be *chignons*, and bonnets hardly worthy of the name.

From Irkutsk the thoroughly organised system of posting enables the traveller to reach Russia Proper without further *désagrémens* than those incidental to a land journey of four thousand miles.

7.—Earthquake in the Cachar Hills. Extracts from Letters from Captain GODWIN-AUSTEN.

"Camp Apalos, 14 Jan., 1869.

"I must now give you a short account of an earthquake we have had here, and such as I do not care ever to experience again. It took place on the afternoon of the 10th. I had been working in the office-tent during the day, and on its getting chilly, about half-past four, I shut up, and went into the sleeping-tent for my choga, before going outside with the telescope, which required cleaning; while stooping to take the choga from the bedding, I heard call out, 'An earthquake! an earthquake!' I left the choga and ran out; I had not then felt it myself, but by the time I had got outside the ropes, there was no mistaking the fact, for the ground was beginning to rise and fall tremendously, and at last became so bad that it was with difficulty I could keep my feet. —'s children were sitting on the ground, all crying, and this, with the shouting of the servants, and the kicking of the ponies, &c., prevented my hearing any particular sound, save the crushing of the large forest trees that are near our camp; these were tossed about in the wildest way, and one very large one close by came down.

"The motion, in addition to the waves that passed by, consisted of a jerking or shaking. Everything upon tables or chairs was thrown off, no two-storied, or even one-storied house of brick could have stood it; here where the houses

are of wood and bamboo—a mere frame—it would require a terrible earthquake indeed to throw them over.

"After the motion had been going on for about fifty seconds, I went into the office-tent, and got out the chronometer. The intensity of the shock had then passed; in fact this must have occurred about twenty seconds from the time of the first shock, and this did not last more than ten seconds. After I had got out the chronometer, and had looked at the time, the last waves were passing, very like those of a gentle swell at sea. It was a curious sight from here (camp) to see the way in which the wave passed over the forest-clad mountain side, as if the trees were bowed by the passage of a mighty wind. The direction of the motion was from west to east, and it went rumbling and roaring away in the distance.

	n.	m.	s.	
Time of first shock ..	4	35	6	
Ditto second	4	47	46	
At	4	39	01	were two jumps of the earth, quite perpendicular.
At	4	39	20	
At	3	41	40	another slighter shock.

Some fourteen or fifteen happened between this last and 6 A.M. next morning.

"On the 11th we had a shock at 7:20 P.M., another at 9:25 P.M., and several during that night.

"Jan. 12th two; one at 6:16 A.M., and at 9:48:30 A.M.

"On the 13th I went up to Mahadeo, a high peak to the south of this, and when observing there with the theodolite, there was a smart shock. It was very curious to see the bubble of the level moving backwards and forwards long after the shock had ceased to be felt by us;* the tremor of the ground continued a long time: I was taking vertical angles at the time, and had to wait until the earth had composed itself.

"At 3:30 A.M. of the 14th, we had our second great shock: it was very smart, but not equal to the first, which ushered in these seismic disturbances. I shall be anxious to hear whether these earthquakes have travelled from the westward far, but possibly they may have had their origin in this range. This part of Cachar is an area of great contortion and upheaval, where we may expect a weakness in the earth's crust, and a renewal of former disturbing action.

"It was curious to notice how the hoolocks in the forest were frightened: many of the shocks continued after it had become dark; these animals kept calling out as they do in the day time, which is what I have never known them to do, and I have wandered a good deal in these forests.

"There were no atmospheric appearances noticeable. On the 10th it had been rather hazy over the distant hills; after the earthquake it was clearer. I remarked this, as I had got out the telescope to see whether a certain trigonometrical station mark was showing."

Captain Godwin-Austen, writing on the 1st Feb., says:—

"The terrible earthquakes, of which I gave you a short account in my last, seem to have ushered in a period of constant disturbance, which is still going on. Not a day has passed without a shock, we have had one whilst at dinner

* A somewhat similar experience happened to myself at the base-line in the Chuck Valley, in Nov. 1853, near Attuk. I was observing for comparison of bars, and the levels, fixed on strong granite pillars, were violently agitated by an earthquake. This led me to devise certain precautions in measuring the base, in case earthquakes should occur during the measurement. Fortunately, there was no recurrence of the phenomenon.—A. S. WAUGH.

(7 p.m.) only just now; the earth hardly ever seems firm, a constantly recurring tremor is very perceptible, and very disagreeable. Since my last I have been twice up the Mahadeo Peak to observe with the theodolite, and the instrument was several times thrown out of level, the tremor of the ground, even when not perceptible to the senses, was distinctly shown on the level scale.

"The river Barak flowed backward for an hour, and near Sylhet has been so lessened in depth that boats now navigate with difficulty; the earth opened in many places, swallowing up trees and houses, mud and hot water were thrown out of fissures, large areas have sunk, others been raised. Near Cachar a village has been left on a slope, where a long line of low hills has been formed.

"During the great shock elephants and horses all went over like ninepins, and I find that I and — were the only two persons in this camp who kept our feet, and we danced a 'balancee' in front of each other, calling out 'What is going to happen?'

"It will be most interesting to find out how the levels of the country have been altered. I feel certain that great changes have taken place in the peaks. I am getting together all the data I can, and expect to have a very interesting account to offer, relative to the area disturbed, and the directions of the waves. We seem to be here in a very unstable part of the earth."

8.—*An Account of the Land in the Vicinity of Cape Horsburgh, Lat. 74° 44' 24" N., Long. 79° W., and of the Island discovered there.* By ED. P. PHILPOTS, M.R., C.M.

(Communicated by ROBERT BROWN, F.R.G.S.)

Our voyage was partly for whaling and partly for discovery. We sailed from Peterhead, March 31st, 1865, and were whaling in the vicinity of Resolution Island until June 1st. June 14th, we called in at Noursook for native dogs. June 10th we visited the Duck Islands, lat. 73° 40', where we found a large number of elder ducks and lumme's eggs. Being unable to force a passage west, in this latitude, we ran south, and tried to cross in lat. 66°; failing to do so, we retreated north, and, finally, crossed to the west land of Baffin's Bay, July 30th, in lat. 75°. Having arrived in the "North Water," and not wishing to sail southward along the west coast, as is usual, we resolved to visit some of the inlets of Lancaster Sound, in pursuit of whales. August 10th, we anchored at Navy Board Inlet, here we saw a large whale, not far from the shore, going west at a quick rate, and near the beach the remains of a depot of government stores, which had been plundered by the natives; nothing remained but a few tons of coal, and a large number of cask-boops built up to form a landmark. August 14th, we visited Prince Regent's Inlet, the west coast of which was ice-locked for several miles, and the large amount of ice prevented us from visiting Port Bowen as we intended. August 16th, we sailed north, till we arrived in Lancaster Sound, and then in a north-western direction, till we were off Caswell's Tower. Lancaster Sound west of this was so full of ice-floes, that in many places but a few yards of water intervened between it and the beach. August 14th we retreated east, in search of a suitable harbour near Cape Horsburgh.

We sailed as far north as Cape Parker, lat. 75° 10' N. and sent our boats north and south of it, to discover a harbour. Thirty miles north of it nothing is found but an unbroken coast; south is a deep bay (Hyde Bay), and a cluster of small islands, forming good harbours, but too shoal for anchorage. In a small bight in the land 7 miles W.S.W. of these islands, we thought it advisable

to anchor, the currents being too strong along the coast to remain at sea. This night is much exposed, a reef of rocks lies off it (see chart), and a small glacier forms its eastern margin. Afterwards "Queen's Harbour" was discovered, in which we let go our anchor Sept. 1st, 1865, and here we remained eleven months and four days.

Sept. 2nd, James Mutch, third mate, and I travelled north, as far as what we then found to be the centre of an island, formed by the waters of Hyde Bay to the north, and Bethune or Banks's Bay to the south, and we marked the connection of these waters at the north-western point of the island.

"Queen's Harbour," although comparatively open and exposed, is the only spot in the island deserving the name of harbour. It is situated north by east from Hope's Monument, from which place, however, a straight course cannot be steered, as a point of a glacier intervenes. A rock, 6 feet below water-mark, and about 150 fathoms from the shore, is the only danger in this harbour. Upon the outlying point to the south is a cairn which we erected, and upon the beach below may be seen the graves of two of our crew.

Going from Cape Osborne in a northerly direction, we first come upon a low tract of land, dark in colour, and bearing traces of natives. Next, in front of some hillocks, is seen Hope's Monument, which is a conspicuous, dark-brown cone, with a broad base, and hardly covered with snow all the winter. Then the dark land suddenly ends and the glacier begins, probably the latter is slowly progressing over the former, but of this I have no proof. Proceeding northwards we come to the "Outer" point of the glacier, so called because its position was outside another point, when viewed from the ship, which we called the "Inner" point. The edge of the glacier generally ended abruptly in perpendicular ice-cliffs, from 20 to 70 feet above the water at their base. Between the "Outer" and "Inner" points enormous masses had fallen off, and continued to fall all the winter, shaking and cracking the floe, and making loud noises, and the size of the fragments could only be appreciated when the floe broke up in summer, and they floated away as large icebergs, with their upper—formerly their under—surfaces furrowed, at regular distances, with grooves 2 feet in depth and breadth. The ice-cliff generally was white, in some places it was light-blue, in others (from the clearness of the ice) it appeared quite black. *Trachurus chasmodon* made travelling over the glacier very dangerous. In one part of the ice-cliff, a most perfect echo was formed. As the glacier extended westward it rose in height, and became continuous, with some high mountains, perpetually covered with snow. About 8 miles from the "Inner" point, the ice-cliff and glacier end, and gradually become continuous with the low land, but the glacier extends westward as far as the eye can see. Immediately after the glacier ends, a series of small hills (some very verdant) commences, in the hollows of which are large pools of water, and it was hereabouts that some sledge-marks were seen. Proceeding along the coast, as we turn eastward, the land becomes low and swampy; but generally rises, as it recedes from the beach, until it forms a range of high, dark-coloured mountains, in some places covered with snow, which form large avalanches; these mountains run east and west, till the eye loses them. Still going eastward the coast lies low, but afterwards forms a series of small hills, which gradually increases till it forms the bluff cliffs of Cape Parker, and thence runs many miles northward.

I will now trace the coast of the island from "Queen's Harbour," going N.W. First we come to a long "wall" of loose shingle, forced up by the "ground ice," heavy pieces of which lie aground at low water, then the wall is changed into mossy hillocks, forming the banks of a rivulet which runs with great force into the main channel. This rivulet appears to have its source from two lakes, each between one and two miles square, which contain

salmon, and are probably connected with other lakes in the vicinity. Behind the north bank of the rivulet is the swampy land which forms the whole of north-west corner of the island, and which is covered with large pieces of heavy ice. The north shore of the island was never visited, as it was too swampy to traverse in the summer, and in the early spring we were too busy with the ice-saw to explore it. High rocky hills form the north-east corner of the island, which is bounded by a deep bay full of icebergs; from one of three high hills to the south of this bay, on the 18th of March, the captain and I sighted Smith's Sound, which, though not free of ice, was very open, and the floe had broken up about a mile from the shore; at the same time we also noticed the two small islands marked in my map, as lying below us to the southward. The skull of a musk ox was picked up south-west of these islands on the beach, which continues low till we reach the islands east of the bight we first anchored in. The water around these islands is very shoal, and boils with a tremendous current, two of the islands stand away from the rest, and are breeding-places for eider-ducks and other birds. A range of high stony hills stretches from these islands to the south-west, standing behind a low swampy beach, on which may be seen a conspicuous volcanic hill, formed of large sharp and loose stones, which we named "Thomson's Monument." Between "Thomson's Monument" and the south point of the island are the remains of a large native settlement, and bones of foxes, dogs, deer, narwhal, white whales, and walrus, &c. &c., lie scattered on the beach in great profusion. Upon the south point of the island is the large cairn that we erected, surmounted by an icepole, which we named "Icepole Point." A comparatively deep bay intervenes between the south point of "Queen's Harbour" and "Icepole Point." The lowland that forms its beach is very swampy, and abounds with snipe in the summer.

The centre of the island is a swampy plain dotted over with many fresh-water lakes, varying in size from two square miles downwards. Upon this plain are scattered boulders of hard red stone, from four to twelve square feet in size. A series of valleys filled with snow lies amongst the high hills to the eastward of "Queen's Harbour." These valleys were frequently bridged over with frozen snow, which afforded a tolerably secure passage, though the snow from underneath the bridge at every footfall fell with a startling noise.

Banks's Bay is very deep, even up to the edge of the ice-cliff, for a great distance, but the water soon "shoals" as the channel runs north. Six or seven miles north-west of "Queen's Harbour" a "bar" runs across the channel, which is nearly dry at the lowest tides, also, at the same time farther up, a great deal of land appears above water. The icebergs which fill Hyde Bay, and which are grounded so far west, prove it to be a deeper channel than Banks's Channel. I have marked on my map a large rock to the south of "Thomson's Monument," but its position is unreliable, as I did not take its proper bearings.

From September 1st, during the winter, light winds blew almost steadily from S.W., but we had gales upon the dates and from the quarters I shall now mention:—October 26th, N.; November 6th, W. to W.S.W.; December 2nd, S.; 3rd, terrific circular storm, suddenly changing from S.W. to N. and to S.W.; January 26th, S.W.; February 6th, N.E.; 20th, S.W.; 26th, E.S.E.; March 30th, N. by E.; April 16th, N.W.; 23rd, S.W.; 25th, N.W.; May 29th, S. by E. to W. by N.; June 5th, N.E.; 12th, S.W.; 29th, N.E.; July 2nd, N.; 5th, S.E.; 8th, N.E.; 11th, N.E.

Until August 27th we were delayed in the "North Water" by a tight barrier of ice, which extended from Cape York to the River Clyde. We had once so despaired of ever reaching home that we chose what we then thought to be the least of two evils, namely, a second winter, in preference to drifting south in the pack. With this view we began again to sail up Lancaster

Sound, which we knew was clear of ice, to try to find any of the government stores that were left for Sir John Franklin; but we had not proceeded far before the crew mutinied, and we turned back and took the pack. Whilst sailing south, with every available sail set, and driving the ship and forcing her through the ice for life or death, we saw the steam-ship *Diana* of Hull, beset in the ice off the River Clyde, but could render her no assistance. She drifted in the pack to the south, and after a few months' delay arrived at home, crushed and leaky, her captain and many of her crew dead, and others dying. To Mr. Smith, her surgeon, whose acquaintance I made at this anxious time, and who is now medical officer to Mr. Lamont's expedition to Spitzbergen may be attributed the credit of her being brought home at all.

Our vessel, the *Queen*, arrived in Cumberland Gulf, and made a tour of it, she then anchored in Nieuwstatik Harbour to prepare for sea, after which she made a quick passage home, having been absent nearly nineteen months.

During the voyage we satisfactorily determined—

- I. That the land on which Cape Hersburgh is situated is an island.
- II. That there is open water all the year round at the mouth of Lancaster Sound.

III. That there are no natives or deer on North Devon.

Our voyage also is of interest, on account of the high latitude we wintered in ($74^{\circ} 44' 24''$ N.), and because we are able to tell the state of the ice, as far 90° west longitude, in Lancaster Sound and in Prince Regent's Inlet, and so increase the number of journeys made to these rarely visited parts, and thereby assist the statistics. And lastly, we found for a fact that white whales and walrus are in $74^{\circ} 45'$ N. lat. as late as October 12th.

9. *Hydrographical Survey of Ladoga Lake*. Translated from the Russian of A. ANDREYEFF. By E. DELMAR MORGAN, F.R.G.S., late H.B.M. Acting Vice-Consul at Onega.

WE are accustomed to hear that the Ladoga Lake is stormy, full of rocks and dangerous shoals, and that its navigation is fraught with danger. But this widely spread opinion is not quite accurate. The chief obstacle to the navigation of the lake has been that hitherto no good description of it has been written, and no full and accurate chart drawn out. It was not until very recently that a hydrographical survey of the lake was made, by a special commission whose labours are now concluded.

And yet the Ladoga Lake from time immemorial served as a means of communication between the Slaves of Ibmén on the one side, and the Varangians, and subsequently the German trading towns, on the other. Owing to this the Ladoga Lake is mentioned in Nestor's manuscripts under the name of Nevo. Upon the invitation of the Varango-Russ by the Slaves in the year 862, Rurik built his town of Aldenborg (Ladoga) near the bank of the Voicboff, 12 versts from the lake. The lake itself is mentioned in the commercial treaty made in 1201 between the Gothlanders and the Novgorodians under the names Alda, Aldesk, Aldagen; and not until 1228, in the time of Kulas George II. Vsevolodovitch, do we hear of it under the name of Ladoga.

During the development of trade between Novgorod and the Hanseatic towns, the Ladoga Lake formed part of the water communication by means of which this larger trade was carried on; and the whole water-way between Novgorod and the Gulf of Finland was known under the name of the "Novgorodian." The great importance attached to this channel for trade gave rise, as early as the commencement of the twelfth century, to contention between the Swedes and the Russians for its possession, but especially for that part of

it formed by the banks of the Neva and Ladoga Lake. The principal points at which this struggle was most obstinate and severe were,—the embouchure of the Volchoff into the Ladoga Lake (site of the town of old Ladoga), the source of the Neva in the lake (where in 1323 the town of Oréshék existed) and lastly the embouchure of the Neva into the Gulf of Finland. With the fall of Novgorod and the discovery by the English of a sea-route to Russia by the White Sea in the sixteenth century, the importance of the Novgorodian water-way diminished, and the Swedes were enabled to remain masters of the Neva and Ladoga Lake till Peter the Great restored to Russia her former possessions.

Unfortunately there are no reliable data as to the build and size of the vessels employed on the Ladoga at the time it formed part of Russia's most important highway for commerce. In the neighbouring monasteries, however, are sometimes to be found old drawings and models, the works of the religious inhabitants, representing a kind of craft which exactly resembles the *soimas** of the present day. This fact, and also the primitive character of the modern *soima*, leads one to infer that the Novgorodians employed craft of the same kind as the *soimas* of the present day.

The Ladoga *soima* is made of the wood of the place, and entirely without nails, which are replaced by thongs, made of the fibrous roots of trees, so that there is no metal nail, bolt, or pin about it; notwithstanding this, it is an excellent craft for coasting purposes, being cheap, strong, light in the draught, capable of taking a good cargo, fast, and a good sea-boat; its lines are good, and it is as servicable under oars as under sail.

In this state Peter the Great found the ship-building on the Ladoga Lake. With a view to building a fleet, he sent, as early as 1702, a commission to the River Pásha, where, time out of mind, the vessels which floated on these waters were built. The Commission had orders to inquire into every particular about ship-building, and to take soundings on the Rivers Pásha, Oyata, and Svir. Having travelled abroad and learned the art of ship-building in Holland, Peter the Great found the Ladoga craft unsuitable, and he therefore selected a place on the Svir at Lodenaya Polia,† where he constructed a dock for building vessels adapted to warlike purposes.

Somewhat later there appeared on the lake, for coasting purposes, galleots and craft of a very Dutch-like construction, which have continued from that time down to the present.

Peter I. was indefatigable in visiting the docks and watching the ship-building. He entered into every detail for fitting out the new vessels, and tried their qualities when completed, surveyed the water in several places near Kotlin and in the Neva at the rapids of Pell, and once actually tried to sail from the Svir to Ladoga in a galleot; unfortunately, his galleot grounded on an unknown shoal in the lake not far from Svir, and no efforts could take her off. This shoal is still known under the name of the Imperial or Tsar's shoal. Here the Emperor left the galleot and set out in a small boat for Svir, on the way to which place he was overtaken by a violent storm.

This episode in the life of Peter the Great is well known, and history affirms that on reaching shore the Emperor determined to punish the lake,—a threat which the ignorant peasants understood to have a literal signification, but which, no doubt, referred in his own mind to a careful survey of it.

It is much to be regretted that Peter the Great's intentions on this head remained unfulfilled. It is evident from the archives of the Hydrographical Department of the Ministry of Marine that no survey was made of the lake up to the year 1763.

* The *soima* is a kind of decked boat used on the Ladoga Lake. † Field of Lodi.

These archives contain four charts of the Ladoga Lake, made at different times, but one of which is useful for navigating purposes, namely, that published in 1845 by the Hydrographical Department, compiled from Schubert's Trigonometrical and the Topographical Surveys in 1824 of the south shore, and Steingel's Military Survey in 1797 of the Finnish coast.

Even this chart is very imperfect, owing to its not showing many of the shoals near the southern shore of the lake; the Finnish islands are not marked on it, as they formed no part of a military survey, and the eastern coast of the lake is altogether inaccurately delineated. Besides its other imperfections, this chart refers only to the surface of the lake, and is therefore of very little use for the purposes of navigation.

Added to the want of a good chart is the total absence of buoys to mark the shoals and rocks, and the imperfectly lit lighthouses. These are the reasons for the lake having so bad a name, and being considered stormy, full of rocks, and dangerous to navigate.

It was in consequence of a petition presented by the inhabitants of the town of Sordopol, through the late Governor-General of Finland, Count Berg, praying for better charts and greater facilities for navigating the lake, that the Lord High Admiral, President of the Geographical Society, authorised in 1857 a full hydrographical survey of Lake Ladoga, which was commenced the following year by a commission, consisting of but a few persons, and who, though straitened in their finances by a reduction of the grant in 1862 by one-half, or 3600 rubles (500*l.*), have now almost completed their labours.

The following results have been obtained by the hydrographical expedition to Lake Ladoga. Twenty-eight astronomical observations were made with the assistance of the latest scientific discoveries, and in four places magnetic co-ordinates were determined. Topographical drawings were made of the shore-line and islands over an extent of 2548 square versts; * soundings were made along the coasts to a distance of 15 versts from the shore, over an area of 2464 square versts, and also in the middle of the lake, over an extent of 10,000 square versts; maps and plans on a large scale, 100 fathoms to the inch, of the rivers, bays, anchorage, &c., have been sent to the Hydrographical Department, together with seven large volumes of manuscript, giving full particulars of the proceedings of the Commission, and sundry data for hydrographical description. From these materials, charts of the Ladoga Lake are being engraved, and the southern portion of it is already done, as well as maps of the Rivers Volchoff and Svir, the former from its mouth to the rapids, the latter from its mouth to Lodeynaya Polia.

The Ladoga Lake occupies an area of 20,000 square versts (6633 square miles); its extreme length is 196 versts, its extreme breadth 147 versts; its greatest depth is 122 fathoms at a part of the lake west of the island of Valaam, and in the meridian of the town of Sordopol. The incline of its bed is gradual from south to north, commencing at the southern shore with its most shallow part, and gradually increasing in depth towards the north, at first by very slow degrees, but on approaching the northern shore, more rapidly, so that the northern and north-western parts of the lake are the deepest. In this part of the lake the depth of water averages nearly everywhere 60 to 100 fathoms, and the wild lofty cliffs rise perpendicularly from its surface. The average depth of the lake may be stated at 50 fathoms.

The soil at the bottom of the Ladoga Lake consists principally of mud, in as liquid a state as well mixed light-brown paint; some of it, however, is dark brown and dark grey in colour; on the south side of the lake, and near

* A verst is two-thirds of a mile English.

the eastern shore, the bottom is composed of sand of various colours, in some places pure, in others mixed with sand.

Specimens of the soil from different parts of the bed of the lake have been sent to the Academy of Sciences for analysis.

The geognostic formation of the shores of the Ladoga Lake is very varied. The southern shores are generally low, almost treeless and untruly; they are composed of clay, sometimes pure, but generally mixed with sand; in the lower strata the sand is so mixed up with the clay as to be in consistency almost as hard as stone. Judging from the excavations for the new Ladoga Canal, it is probable that the whole low-lying shore of the lake was formed in a long process of time by the alluvial deposits of the rivers falling into the lake. In these deposits are to be found a large quantity of granite stones and boulders of all sizes. The Silurian limestone or flag-stone extends all along the southern shore, but does not approach the edge of the lake. This formation continues for 8 versts (5½ miles) south of Schlisselburg, and as far east as Putilovo, a village 4 versts from the lake; it then extends to the village of Lukino, the most elevated ground on the southern shore of the lake; the layers of limestone bear away thence to the eastward to the town of Old Ladoga, and crossing the river Volchoff, continue to the River Siassy, and cross the Pasha. This formation is thus at a good distance from the lake, and only approaches it at one point, viz., at Cape Storozhensky, between the Rivers Siassy and Pasha, in the form of a sharp wedge; not far from here, and close to the village of Zagubia, the Seir canal is cut through pure Silurian limestone.

The western shore of the lake from Schlisselburg to Keksholm is low and clayey at first, except close to the edge of the lake, where it is sandy and rocky; but as it approaches the borders of Finland the shore gradually rises; the soil is pure clay, sometimes covered with sand, and full of stones. Near the islands of Surando and Taijal there are considerable mounds of argillaceous soil, filled with stones of all sizes. Further towards Keksholm the shore is tolerably high, the soil a mixture of sand and clay, and containing large boulders in rows lying in a north-westerly and south-easterly direction, and bearing the appearance of having been artificially laid one on another. Here too there are similar rows of small stones. Between the two rows the soil is sand and clay, frequently containing small pebbles of a similar kind to those contained in the rows. There are, besides, sandy hillocks of different sizes.

Beyond the river Voksa, 4 versts to the north of Keksholm, the formation of the coast completely changes. From this point the whole northern shore of the lake almost up to the border of the Olonetz Government is one succession of tall cliffs. The mainland and the islands in this part are very hilly, and the wild beauty of the scenery is very striking. The cliffs are in places quite precipitous. The formation here is granite, which, commencing at Keksholm, is light grey in colour and coarse grained, then reddish, and further north dark grey, close grained and very hard.

Thirty versts north of Serdopol is a quarry of marble called Russkolsky. Not far from Serdopol there is also a quarry of graphite, but of inferior quality, and only fit to be used for the manufacture of fireproof smelting-pots. Here, too, on the island of Taiola Sari is found a granite of excellent quality, grey in colour and finely grained, called "Serdobolsky" granite, specimens of which may be seen in the caryatides at the Hermitage, the statue of the Emperor Nicholas, the St. Isaac's Cathedral at St. Petersburg, and in the monument of the 1000th anniversary of Russia at Novgorod.

At the north-east part of the lake the minerals are exceedingly varied. There are small islands composed of pure quartz, sps, schistose flint, and marble. At Pitkerando, in the Lower Oolite system, copper pyrites and tin ore

are found. The mines here, which are sunk to a depth of 70 fathoms below the level of the lake, yielded in the years 1860, 61, and 62, 10,000 poods (3,200 cwt.) of copper and 1000 poods of tin. In 1863, 5000 poods of tin were produced.

The islands of Valaam are in the northern part of the lake, and are about 20 versts from shore. They are remarkable for their natural beauty as well as for their formation. They are all composed of solid stone. It is asserted that this stone is gneiss; but I am of opinion that the Valaam islands have not been sufficiently investigated by geologists.

The small islets of the Valaam group are more particularly interesting, owing to their remarkable formation; they are known by the names of the Holy and the Wonderful Isles respectively. They rise abruptly to a great height from the lake, have numberless fissures in them, and are distinctly divided into parallel strata. The depth of water close to their sides is sometimes 70 to 80 fathoms. The minerals in some parts of Valaam itself crumble away from atmospheric influences into a dark red powder, which fills the hollows and ravines in many places, and is very favourable to vegetation.

The east shore of the lake from Pitkerando southwards is tolerably high, and the soil is clay, except on the borders of the lake, where it is sandy. The argillaceous soil, on passing the Olouka rivulet, takes a south-easterly direction towards Lodeinsya Polia. Near the lake itself pure clay is abundant, and extends all the way to the Svir, and the nearer to that river the more flat and barren is the shore. The border of the lake is pure sand, in some places rocky and covered with dead wood. The eastern shore of the lake has a dreary appearance. The land is flat and monotonous, without a village or any kind of building, not even a fisher's hut is visible from the lake, and the monastery of Ondrussoff, with its church and white stone walls, is the sole object for the eye to rest upon.

Several rivers flow into the Ladoga Lake, and their waters vary much in appearance. The Volchoff pours a brownish red muddy stream into the Ladoga, the water of the Siassy is dark red. The water of the Svir, when it leaves Lake Onega is quite clear, but, after flowing the whole length of its course, and receiving the water of its several small tributaries, it loses the beautiful transparency of the Onega water, and at its mouth, where it unites with the Ovat and Pasha, it likewise becomes dark in colour and indifferent in quality. The water of the Olouka is quite dark and muddy. The rivers and rivulets joining the lake on the north pour into it water impregnated with iron, and of a dark bottle colour. The Taipala, which, after leaving Lake Suwando, breaks through in several places its clay banks and leaves its channel, is of a clayey, almost milky, colour. The streams joining the lake on the low, level, marshy coast of the St. Petersburg district, from the borders of Fieland to Schlüsselburg, and from the latter place to the town of Ladoga, are all reddish in colour, muddy and dirty. The Voksa is the only stream flowing into the lake whose water is tolerably clear.

All this water is beautifully cleansed by the Ladoga basin, which supplies the Neva with water, clear, agreeable to the taste, and excellent in every way, particularly during the winter.

The Ladoga draws its principal supply from the Volchoff and the Svir. The former of these rivers, after uniting with the water of the Siassy, flows north through the lake, passing Cape Storozensky, and continuing in a northerly direction. In the same way the water of the Svir, after flowing into the lake, unites with that of the Volchoff, and continues in a northerly direction, gradually undergoing a purifying process, and flows along the east coast of the lake till more than half way up it, when it takes the direction of the centre of the lake, and is merged in the general mass of water.

The waters of the Savolake and Carelian systems are conducted to the

Ladoga by the Taipala River, and, after joining the lake, flow south to Schliesssburg, and meet the source of the Neva near its bank.

Thus the lake, after receiving the foul water, full of organic and inorganic matter, with the assistance of winds and waves gradually purifies it. The inorganic matter sinks by degrees to the bottom; objects floating on the surface are, in course of time, washed ashore, and the organic matter is chiefly swallowed by the fish, which abound at the mouths of the rivers and in those parts of the shore where the current is strongest.

Though the water of the Ladoga Lake is particularly clear, the inhabitants along the coast do not use it, owing to the darkness of its colour, caused by the filtration along the banks, excepting that part of the shore between the Taipala and Kekholm; the inhabitants of the islands, however—viz., Valaam, Konevitz, &c., have excellent water.

In the summer of 1864 we had an opportunity of testing the Ladoga water taken from different parts of the lake and at different depths. The first chemical analysis proved this water to be entirely free of salts or alkalies, and to be perfectly distilled by nature, both on the surface and at a depth of 100 fathoms. The transparency of this water is remarkable. Specimens of it, taken from different places and at various depths, have been sent to the Academy for analysis by M. Struve.

The climate of the lake is severe. The fogs in summer are very thick, but of short duration. At night the lake is almost always calm, but particularly so during the summer. The temperature of the water, from the time of the disappearance of the ice to the middle of summer, averages 2° to 3° (heat) Reaumur; in the month of August the water becomes warmer, but does not exceed 5° or 6° . In the more southern portions of the lake the ice begins to form after the first hard frosts, but the lake does not entirely freeze over till late in the month of January, and in some years the middle of the lake remains unfrozen all the winter through.

The ice on the lake is sometimes very thick; but this depends on the severity of the winter. In a severe winter the whole lake freezes, and then the thickness of the ice is 3 or 4 feet; in a mild winter the middle of the lake does not freeze, and the ice-drifts from one side to another of the lake as the wind blows. The floes get packed by the wind, and form dense masses of ice. One, 23rd May, O.S., we measured the ice at a distance of 60 versts from Schliesssburg, and found it 12 feet thick. This ice was as clear, transparent, and strong, as in mid-winter. The same year a steamer came in sight of Konevitz on the 16th May, O.S., and was beset by the ice for two days, the thickness of the ice round her being 30 feet. Owing to the low temperature of the water of the Ladoga Lake, the ice remains unmelted a long time during spring, particularly about the northern and north-eastern parts of it, where it drifts about the lake in large masses till the sun's rays melt it altogether. In the spring of 1863, the superior of the monastery of Valaam measured the thickness of a block of ice floating near the monastery, and found it to be 72 feet thick. I have myself been in the northern parts of the lake on the 29th and 30th May, O.S., and my passage has been obstructed by quantities of ice, though in small sharp-pointed pieces. At this time the temperature in St. Petersburg was 20° Reaumur, and many of the inhabitants had gone to their country houses. Icebergs form in the northern part of the lake on the reefs of rocks, and sometimes float off the rocks into deep water.

The shipping on the lake is done by the old-fashioned galleots: 600 of these craft come to Schliesssburg every year. Their cargoes are chiefly firewood, logs, fir, timber, Karelian birchwood, laths, granite, quartz, sps, marble, graphite, black sand, gneissstones, round stones, bones, train oil, butter, bark for tanning, hay, copper, tin, cast iron, wrought iron, salt fish, hides, and many other goods which come by the lake from the Svir. Steamers ply regularly

between St. Petersburg and Svir, also to Keksholm, Valaam, and Sendopol. These steamers take goods as well as passengers from St. Petersburg; but towing lighters across the lake does not seem to flourish, particularly from Svir.

Altogether the navigation of the lake is in a bad state, and has made but very little progress for the last 150 years. As an illustration of the primitive nature of the navigation, the speed of a vessel is determined by burning a tallow candle, and no attention whatever is paid to the rules laid down for navigating.

The masters of the vessels consider keeping charts a work of supererogation; they do not even use the compass properly, and consider its deviation, owing to the influence of iron, as the work of supernatural agency.

10.—On the Physical Geography of the Queen Charlotte Islands.

By ROBERT BROWN, F.R.G.S., &c. &c.

FIXING that little is known regarding this interesting group of islands lying off the North-West Coast of America, and a dependency of the colony of British Columbia, I have drawn up this short account, derived almost entirely from observations made during a visit in the spring of 1866.

1. History of their Discovery.—These islands were undoubtedly first discovered by Ensign Juan Perez, in the Spanish corvette *Santiago*, on the 23rd of January, 1774. La Perouse suspected their separation from the mainland; but it is to Capt. Gray, an American trader, and the discoverer of the Columbia River, that the credit of the first exploration of the coast-line is due. However, it ought to be mentioned that, two years previously (*viz.*, in 1787), Capt. Dixon, commanding the merchant-ship *Queen Charlotte*, of London, had become convinced of their insularity, and applied the name of his ship to the group. Gray, apparently unaware of the prior discovery of Dixon, named them also after his vessel, the Washington Islands or Island, for up to a very recent period this group, now known to be composed of three main islands, were always supposed to be one island, and spoken of in the singular, as, in ordinary parlance, they are still on the north-west coast. Captains Duncan, of the *Princes Royal*, and Douglas, of the *Iphigenia*, about the same period explored portions of the coast, and conduced to our knowledge of their complete insularity. Meares, no doubt, endeavours to secure for Douglas the credit of establishing this point, but I think on insufficient grounds.

Ingraham, in 1791, also visited them and made some explorations. In a work published by him and Dixon, giving a narrative of their voyage, will be found some interesting information about their natural history and the language of the natives. In 1792 Captain Jacinto Caamano, commanding the Spanish corvette *Arzobispo*, cursorily surveyed the northern end of the islands. Since that period they have been regularly visited by traders; the officers of some of which have added a little to our knowledge by surveying some of the harbours and inlets separating the different islands. Under this head the names of Captain G. H. Richards and his officers deserve honourable mention. Of late years the discovery of gold, copper, and coal on these islands, and the establishment of the colonies of Vancouver Island and British Columbia (now united under the latter name) have attracted more attention to the group; though they are still very little known, even on their coast-line, and their interior is entirely unexplored.

During the few weeks which I passed on the islands I was confined almost wholly to Skidegate Bay, the period of the year not allowing of any journeys being made at a great distance, and the Indians declining to travel unless

when paid exorbitantly, the attraction of our vessel being too much for them. It being necessary for the purposes of the miners, who had come up to examine the coal to be subsequently described, that the vessel should be moored, we were unable to avail ourselves of it to make any explorations. I, however, gained a fair general idea of the vicinity of our anchorage, and collected from the Indians, &c., much information which may lead to further examination: and in default of something better, I think that I am justified in presenting it to you.

2. *Topography of the Islands.*—These islands lie between $54^{\circ} 20'$ N. lat. and $51^{\circ} 55'$ N. lat., between the extremes of 133° and $130^{\circ} 35'$ W. long., and at distances varying from 20 to 80 miles according to the trend of the coast, from the nearest islands lying immediately off the mainland. It is only on very clear days, and at the narrowest portion of the strait that they can be seen from the mainland or vice versa, and then only as a hazy outline.

They are separated by two narrow channels into three main islands, viz., Graham Island, Moresby Island, and Prevost Island, though many smaller islets lying off the coasts of these larger ones, narrow still more the inlets separating them. North Island or "Katsesqueye" of the Indians is the most northerly point, and Cape St. James on Prevost Island is the Land's End of these remote dependencies of England. Moresby Island is high and mountainous in the interior, but with a long stretch of flat land skirting the whole eastern coast of the island. The western shores of all the islands are much more rugged and precipitous than the eastern, and the southern islands are again much lower than the more northern ones. Skidegate Channel and Douglas Inlet (or "Chatlou"), separating Moresby from Graham Island, varies in width from 1 to 2½ or 3 miles, and is quiet and land-locked with many secure anchorages.

The island at the western entrance of Douglas Inlet the Indians call "Chalque," and is claimed not by the Skidegates but by the Gold Harbour Indians. "Kauna" is the name of Cartwright Sound. The two sounds above it are called respectively "Keyw" and "Kanen," and though not followed in are said to go very deeply into the land, cutting the island up in many places into peninsulas. Hippa Island is called "Quequetz," Frederick Island "Naaton," and "Nalsden" is the aboriginal name of Virago Sound. "Nalquist" is the name of Masset "spit"—a long projecting flat point, extending into a sandy shoal, often covered with boulder-drift and very dangerous to ships. On Ross Spit two ships were lost. In crossing the spit at the entrance to Skidegate Strait we knocked the false keel off our schooner. It would be therefore advisable for the Admiralty to have these surveyed. At Anthony's Island is a deep inlet called "Laskock," which crosses nearly to the west coast. The Indians paddle up from about 6 to 12 o'clock, then haul their canoes over a narrow neck of land and launch them again in Tasse Harbour on the other side. In a little harbour called "Skofungey" there are said to be immense numbers of sea otter. My informant described them as being as thick as ducks at a river-mouth in winter. About Tasse Harbour there is another small harbour called "Pawee," where they are said to be equally numerous. Gold Harbour is generally called "Skiton," but the name more particularly applies to Mitchell's Harbour, a smaller anchorage off the main one. Douglas Harbour is "Sontie," and Mudges Harbour is called "Howleini." Kuper Island is "Shunkingwee," and above Madges Harbour in Port Kuper is another known as "Nawee," while still further up is "Chowash." Nearly all of the sounds are not known even by name to the whites, and others are marked on the chart as breaks in the coast-line, but unnamed or with no intimation of their extent. Some of them are united, being only separated into two by an island or islands blocking up their mouth; and accordingly, if followed in, it would be found that these islands

would present a totally different contour from what they do at present on the imperfect chart of the coast, and are of much less superficies. The interior, as I have said, is yet entirely unexplored. The Indians pass through from certain places, as I shall notice in giving an account of the native tribes inhabiting the shores of the islands. The whole surface of the country is densely covered with forests of various trees, chiefly conifers, and a dense undergrowth of various species of shrubs. This, combined with the absence of deer, will render an exploration of the islands somewhat difficult; but I should suppose that the deep inlets cutting the islands on either side will be found to materially aid in the penetration of the country. The whole country in this region of the North Pacific is wooded; but that, as in the exploration of Vancouver Island, though rendering travel arduous in the extreme, yet was found not unsurmountable. The absence of large game for food is, however, more serious.

3. *Geology, Mines, and Metals.*—The general geological structure of these islands appears to be beds of conglomerate, slate, coal, and metamorphosed sandstone, resting upon erupted greenstone, and dislocated, tilted, and altered, so as to render the tracing of the beds, even where the dense layer of vegetable matter allows of this being done, a matter of some difficulty. On the north side of Skidegate Bay a tunnel has been driven into the hill in a westerly course, showing the structure of the beds. This tunnel is 112 feet long,* and first penetrates: 1. coarse igneous-looking shales, splintering into conchoidal fractures; 2. a fine-grained slate, out of which the pipes and other ornaments so well known in European museums are cut; 3. coal; 4. coarse slate; 5. metamorphosed sandstone, apparently resting on the greenstone. These rocks are much disrupted, and there are many faults which, in a superficial examination, I did not find it possible to trace out. The strata on the two sides of the bay are not continuous. The general character of the stratification is shown on the sections.

The coal has all the character of anthracite, but is altered and metamorphosed by the presence of igneous rock in a remarkable manner. Some portions of the seam are soft, like gunpowder, and you may push your hand into the mass; while scattered here and there through this are seams of hard anthracite, agreeing in composition, mineral character, and heat-giving and burning properties with that valuable species of coal. Wherever an excavation is made, fire-damp accumulates in quantities. In Nanaimo (where the beds are of Cretaceous age) there is no fire-damp; but, again, at Bellingham Bay (Upper Tertiary) it is abundant. Hitherto two companies have made some efforts to develop this, but have not yet been successful in obtaining any amount of this hard anthracite, the character of the beds being just as I have given it, varied from irregular jet-like seams to masses like wet gunpowder. Some 55,000 dollars have been spent on this prospecting, but without any return. If, however, anthracite could be found in abundance on the Pacific coast, the effect of this discovery in developing the mineral and other resources of the adjacent countries cannot be over-estimated. The following is an analysis of some averagely good specimens from this mine:—

Moisture	5.10
Volatile combustible matter	17.27
Carbon	71.20
Ash	6.43
	100.00
Specific gravity	1.46

* At the date of my visit, April, 1886.

It thus appears that it is almost as good as Pennsylvania anthracite for smelting purposes, its heat-giving properties being immense.

This fine slate,* associated with the coal, is easily carved, and is extensively used by the Indians for making ornaments, such as elaborately ornamented pipes, flutes, statuettes, platters, &c., for sale to the whites in the southern towns; and many have found their way to Europe and into different museums, though their origin is not always very apparent from their labelling. Those who have once seen them can never fail to detect not only their material, but the peculiar, quaint, *outré* style of art displayed in their manufacture. In the metamorphosed sandstone are found (more particularly along the northern shore of the Strait) casts of a bivalve shell in considerable numbers, but hitherto this is the only datum we have to ascertain the age of the deposits. In the British Museum are now some of these remains, but with such fragmentary data it is questionable if any exact deductions can be arrived at as to the position of these peculiar coal-beds. I think, however, that there can be no reasonable doubt that these are much older than any other coal-beds on the North Pacific Coast; those in Vancouver Island, Washington Territory, Oregon, and California being either members of the Upper Secondary or Tertiary formations. For long periods large masses of virgin copper have been seen in the possession of the Indians, and used by them for making the large plates on which their *totems* or coats-of-arms are engraved, as will be afterwards described. Some of these pieces were perhaps traded from more northern tribes, but others have been undoubtedly found on the islands. Copper (chiefly in sulphates and carbonates) has been found at several places on the island, and at Gunshaw Harbour, on Moresby Island, a company was engaged for some time in working the ore, but have at present suspended operations for want of capital. It appears that the following indications were found:—1. A vein of copper traceable for 700 to 800 yards along the shore of Burnaby Island, from the east point beyond the miners' hut, along the s.e. shore towards the hut; 2. a cross copper vein, from where No. 1 is lost under the sea, running s.e. and s.w. across the promontory towards Blue Jay Harbour; 3. a very strong quartz vein, on the north side of Blue Jay Harbour, clearly visible; 4. a small horizontal vein, to eastward of No. 3—iron and copper, and mixed with quartz; 5. a clear and well-defined outcrop of a copper vein on Skincuttle Island, running s.e. and s.w., but cut off by a dyke; 6. a twisted and mixed outcrop of a copper vein, on opposite or n.e. side of Skincuttle Island; 7. a large quartz vein on George Island; 8. a large quartz vein at s.e. end of George Island, which crosses the island and meets No. 10; 9. a copper vein, rich in green carbonates, running s.s.w. and n.e.; 10. a vein of copper and iron on the mainland, at the entrance to Harriet Harbour, on the south side of Sockalos Harbour;† On some of the northern parts of the island copper has also been found, and one specimen gave on analysis 96 lbs. to the ton—value about 1400*l.* the ton. Half-way between Tasso Harbour and Awce (formerly referred to) the Indians say there is plenty of copper; and though, in general, such aboriginal statements ought to be received *cum grano salis*, yet in this case I see no reason to doubt them.

* When I call this rock "slate," I am, perhaps, giving expression to the vernacular name for it rather than stating a geological fact. In appearance it resembles canal coal, dark, fine grained, with a (frequently) conchoidal fracture, and capable of taking a smooth bright polish. It has none of the fissile properties which we are apt to associate with the term "slate." However, for want of a better name, I will continue to speak of it as such. Those who are curious regarding it, can examine specimens brought from this locality by me, and now in the British Museum.

† For some of these particulars I am indebted to Mr. Robert Plummer, mining engineer, Victoria, Vancouver Island.

Though I have examined several of the small Queen Charlotte rivers (or streams flowing from the mountains), I was unable to detect any gold in their beds. However, gold has been found in quartz veins on the island in considerable quantities. As far back as 1850 or 1849 the Indians were in the habit of bringing rough gold to Fort Simpson, on the mainland, opposite Queen Charlotte Islands. At first they valued this lightly, and there is a tradition floating about the north-west coast, that a Kanaka, or Sandwich Islander, in the Hudson's Bay Company's service, while skinning a deer sold by an Indian, found that it had been shot with a nugget of gold.* It is even said that in old times the Indians pointed their arrows with gold! Be this as it may, like the rest of mankind, they speedily discovered its value, and more than its value, for they put a most extravagant price on the pieces which they brought. On one occasion an Indian brought a very large piece of solid gold, free from quartz, to the fort, but refused to sell it unless at a ridiculously exorbitant price. This piece has now been lost sight of, and has not, as far as I can learn, been offered for sale, though the possession of such a piece was sure to be rumoured through among the natives or traders. This gold was soon found to come from a locality on the west of the island, now called Gold Harbour. The Indians lit fires over the vein, then dashed water over it when hot to disintegrate the quartz, and with the aid of tomahawks grubbed out the pieces, which they sold. In 1862 the Hudson's Bay Company sent up a party in the *Uta*, under the command of the late Dr. Kennedy, who set to work to blast out the quartz from the auriferous lents, but they failed to find the spot where the large nuggets had been found; and though the natives pretended to show the locality, yet nothing approaching to their expectations was discovered. The Indians were powerful and fierce, and proved very troublesome. No sooner was a blast exploded, than hundreds rushed in and seized on pieces, so that what was collected bore but an indifferent ratio to what was stolen by the aborigines. To this day Indians bring down pieces to Victoria, and a periodical semi-excitement ensues over them; but they are in all likelihood only remains of these dubious acquisitions (though certainly it can scarcely be called robbery, as the gold miners were mere filibusters, striving no doubt to solve the problem of the dog in the manger). However, a considerable quantity was blasted out and brought down. I have a specimen, in which the gold is thickly scattered through the quartz, and the whole is described as having been exceedingly rich in the precious metal. The lead was, however, wrought out; nor has it ever been able to be traced since, notwithstanding the locality has again and again been searched by several experienced miners. The vein as originally found (in Mitchell Harbour, an anchorage of Gold Harbour, so called) was 7 inches wide, was traced for 80 feet, and contained 25 per cent. of gold in many places. The heaviest specimen of pure gold yet obtained from this locality weighed from 14 to 16 ounces.

In July, 1869, Mr. William Downie and party examined the place where the gold was taken out by the *Uta* party, and found a few specks in a small quartz vein running through slate.† They then explored Douglas Harbour without any success, and afterwards proceeded to Skidegate Channel, which lies between Graham and Moreby's islands. They found trap and hornblende rocks, with a few poor seams of quartz, but no gold to the southward. To the northward they found talcose slate, quartz, and "red earth," but no gold; but coming upon coal in the Skidegate Channel (already described) they decided that further search was useless. They then blasted at Gold Harbour,

* This must have been on the mainland, as there are no deer on the Queen Charlotte Islands.

† The existence of gold quartz veins alone goes far to prove the antiquity of these slates, so that in all probability they are members of the lower secondary.

but without success. The conclusion they came to was that the gold (as found by the first party) existed in an offshoot, or a "blow," instances of which are very common. On such a discovery being made in California, hundreds of miners take claims in all directions near it, and test the ground in every way; but nothing is found except in the one spot, about 70 feet in length, running south-east and north-west. On being worked about 15 feet it would give out. Before work commenced, miners have been known to blow the sand off a vein of pure gold.* Captain Robert Torrens, late Clerk of the Colonial Parliament of Vancouver Island, examined the country further north for gold, but without much success. He described the country north of Skidegate Channel as being low and thickly wooded, receding in one unbroken level to a huge range of mountains about 30 miles off. Vegetation is here luxuriant, and at intervals patches of open land occur, in which the Indians have planted crops of potatoes. He found some sulphurates of iron, containing, as is usual, a little gold, but on the whole the rich quartz veins of the Queen Charlotte's Islands remain to be discovered; and I do not doubt of the search being successful if followed up in an energetic, systematic manner, aided by a fair amount of practical skill, combined with scientific knowledge. Among other economic minerals I have found staurolite on the shores of Skidegate Channel, and Mr. Farwell, C.E., brought me pieces from the neighbourhood of Masset Harbour (where there is also coal approaching to cannel coal), and the Indian told us of a mineral which is exposed at half-tide, at a place called *Challens*, in the first inlet above Hippa Island. They declare they can melt it down for bullets; and, if so, it is in all likelihood native lead. I have heard this story so repeatedly, that though unable to obtain specimens, I am forced to believe in its existence. Boiling springs are said to be found at *Clew*, on the southernmost island. These hot springs are found at different places in British Columbia, and many in southern Oregon; sometimes a boiling and an icy cold one within two yards of each other, a curious phenomenon, perfectly simple of explanation, viz., that the boiling one is of deep-seated origin, while the cold is only a surface spring. There are, however, no volcanoes, either active or extinct, in these islands, though Mr. Mallet places one erroneously on the northernmost island, in his 'Map of Earthquakes and Volcanoes.'†

4. *Climate, &c.*—Though situated so far north, the climate of the Queen Charlotte Islands, from their insular position, is much milder than that of the mainland. Some men who wintered upon them described the temperature as being moderate, little snow and a great deal of rain. Indeed, all north of Fraser River the climate is very moist. At Sitka it rains almost continuously, the average rainfall amounting to nearly 89 inches *per annum*. When I arrived, on 1st of April, all the snow had vanished off the lowlands, and the weather was mild and pleasant. Mosquitoes were abundant, and towards the end of the month humming-birds had begun to make their appearance. The tides, as all over the north-west coast, where there are so many inlets and circuitous bays, coves, and sounds, are very irregular, and little dependence can be placed on them. At Skidegate Harbour, on the 17th of April, 1886, the rise and fall of the tide, from careful observations by level, was found by my companion, Mr. Edward Stephens, C.E., to be 27½ feet.

5. *Ethnology of the Islands.*—The only people permanently inhabiting these islands are the Indians, generally known by the name of *Hylaks*, speaking one language, having the same personal appearance, and indeed in every respect one people, though politically divided into several tribes under different names. Physically, they are perhaps the finest race on the North-

* See also Mayne's 'British Columbia,' p. 187.

† Brit. Assoc. Rep. 1856.

American continent, and indeed I am not exaggerating when I say that they are scarcely surpassed in appearance by the Western backwoodsman or hunter. The women are very good-looking, though often full in the face and somewhat *embonpoint*. Some of them would be judged to be pretty in almost any civilised community. They have, however, a most abominable custom of disfiguring the lower lip by inserting through it a bone ornament, concave externally and internally, which has the effect of causing the lip to protrude in a shelf-like form, than which nothing can be imagined more hideous. It is only the women who practise this, and until recent periods it was looked upon as a mark of the very lowest breeding to be without this labial "ornament." They commence to get it inserted when young, in the form of a metal tube, gradually increasing the size of the ornament, until it flourishes in all its full-sized ugliness. I have seen some stick a pin through the lower lip; and among the young girls who cannot make up their minds wholly to dispense with it, it is common to insert a thin hollow tube of silver. However, of late years the young ones have been giving it up, finding that it is not agreeable to their Caucasian admirers. The toes and women are tall, muscular, and straight. The face is full, with well-formed head, not in any way disfigured or compressed, as in the more southern tribes, of an oblong form, features high, particularly the nose, mouth average, with the canthi rather pointing downwards, both the upper and lower lips, more especially in the women, slightly protruding. Their hands and feet are small, and well-formed. Their colour is very fair, and in the women, who are not much exposed to the weather, there is a mixture of red and white in their cheeks, not seen in any other aboriginal American race. Their eyes are horizontal, eyebrows rather sloping upwards, and not bushy. Tattooing on the back of the hands and arms, often into fanciful resemblance to the human features, is occasionally seen, and sometimes, as in the women, a few slight streaks (in blue) on the cheeks; but this is not universal. They wear their hair much shorter than the more southern tribes, among whom short hair is a mark of slavery, and most of the children have it clipped quite close; a most sensible arrangement, when we consider that their heads are not always free from vermin. Few of the men have any beard or whiskers. Some of them have occasionally bushy moustaches and "imperials." In their persons they are generally very clean, though their ordinary square or oblong board-houses are as filthy as among other tribes. Their average height is 5 feet 10 inches, though I have seen them measuring 6 feet. They move along with a stately gait and bearing, totally different from the lounging, waddling walk of the flat-head tribes of Vancouver Island, &c. The dress of the men now-a-days consists commonly of European clothes, bought from the traders; and that of the women, a calico dress with a green, blue, or scarlet blanket, with a peculiar hood, both plentifully ornamented with large rows of large mother-of-pearl buttons. The *deshabille* of both sexes is, as among all Indian tribes, merely a blanket. The women have their wrists, and sometimes their ankles, profusely ornamented with bracelets of native manufacture, made out of silver coin, obtained from the traders who visit them. They also wear earrings and rings of the same metal; and often these pieces of jewelry display wonderful skill and taste in the workmanship. Some of the children, whose parents happen just then to be able to afford it, have thick silver rings through the septum of their noses. When the *res angustie domi* trouble them, the ring is speedily removed, and converted into more useful material.

The Hydahs are very bold warriors, but cruel and vindictive in the extreme. Pages might be filled with a narration of their lawless or bloodthirsty acts, which have made them feared and hated for hundreds of miles north and south of their country. Though generally friendly to visitors, they are not to be trusted in the slightest degree, and, having never yet felt the power of the

Whites, they consider that they may commit any outrage (if so it seems good to them) with impunity. Some years ago they fired on the boats of a British war vessel, and in 1854 they captured the American ship *Susan Sturges*, burning her down to the water's edge, after having plundered her of everything valuable, and then held the captain and crew as slaves until they were ransomed by the Hudson's Bay Company. There are men yet in Victoria who have been slaves among these savages. The ringleader in this act of piracy was the chief of the Skidegate, one of the mildest spoken and meekest men whom I have ever met in my life. When we entered his harbour he was polite enough to hoist the *Susan Sturges* flag over his lodge, and give us a salute with her guns standing in front of his door. He is a comparatively young man, but is hated in his tribe. That spring he had killed five men in a drunken quarrel, and now he never went abroad without being heavily armed. At night he would hesitate to go out of his lodge unless one of his wives was with him, fearing that, unseen by him, an assassin might be lurking in the dark. He rarely slept two nights continuously in the same place in his lodge, and his sleeping-place was a perfect armoury of weapons.* Still later, the Massets (another tribe of Hydahs) have been accused of the yet graver crime of murdering the whole crew of the schooner *Grouler*. On the whole, they are far from being an unobjectionable race of people. They are very lazy, and are now, whether naturally or by the influx and visits of traders, thoroughly debauched in their morals. They are drunk whenever spirits can be obtained, and during these drunken orgies their whole vile passions get play. Though making a show of modesty, yet the chief ornament of the female heart is not found among their women; nor does it seem that prostitution implies any disgrace, or that female virtue is valued by the men. These women, both from their beauty and immorality, supply a large proportion of the abandoned Indian women who infest Victoria and all the southern towns during the winter; and they may even be found as far south as the Columbia River, and west even to the Cariboo gold-mines. Many of them accumulate considerable sums of money, which is again squandered among their debauched relatives and hangers on. In the summer they go north to recruit, spreading disease among their people and directly leading to the rapid extermination of their race. Old traders tell me that at one time they were as virtuous as any other Indian tribe before being visited by the whites, and this thorough immorality and debauchery is owing to corruption by the traders. I have no cause to doubt this; on the contrary, I fear that this is too true regarding every savage race with whom the whites have come in contact. It is neither the province, nor within the limits of this paper, to describe the many curious customs of this people. In their broad features they are the same as all the North Pacific coast tribes, but differ in many essential particulars which it is impossible to enumerate. Territorial right, not only as affecting tribes as a whole, but as individuals, is much valued. Nearly every family has some river where they fish, and its possession is strictly guarded. No Andalusian grandee values his *siempre así*, or German "Freiherr" his coat of sixteen quarterings, more than do these people their "gentle blood and long descent"! This same Chief of Skidegate was abusing an individual to me on one occasion, when I took an opportunity of remarking that he had as many blankets as he. Now in blankets consists the wealth of these northern tribes, and their acquisition is the *summum bonum* of all ambition. The reply was characteristic: "I don't doubt that; chiefs are always the poorest men, they have to give so much away; but what matters his blankets, his father was nobody"! In a word, he was a parvenu! Every family has its arma, or, what is called among the

* I have since heard that this mild-spoken ruffian has been assassinated by his own tribe.

Chippewas, its "totem," and no members of a totem can intermarry with an individual possessing the same one. These arms are also engraved on large copper plates, in most grotesque quarterings; and these quarterings can be seen on boxes, &c., in the same family. These plates are about 3 feet long and 1½ broad, slightly hour-glass shaped and rather arched, about a quarter of an inch in thickness. The engraving is very beautifully executed. I have copied several of these, but never could obtain a proper explanation of the symbols on them. These plates are valued at very high rates. Edensaw, a great chief in the northern end of the island, has one which he values at 800 blankets, or 2400 dollars. It has been in his family for many generations, and is of virgin copper. Of late years the traders have been selling them plates of smelted metal, and no greater scandal can be spread regarding a patrician family than to hint that their "copper" is spurious. Nangemesh, the Chief of Skidegate, nearly killed our interpreter, a Hydah boy, because it had reached his ears that he had been spreading this calumny among our party that his copper was bought in Victoria! A great proportion of the copper for these plates was originally traded from the northern tribes. They have the idea that a great fish vomited them out. Many were undoubtedly palmed off upon them by the Russian Fur Company at Sitka.

They excel all other of the American races in their artistic skill. The beautiful pipes, statuettes, &c., made of slate, may have been already mentioned, as well as jewelry made of silver coin. Most of these would not disgrace a civilized jeweller; and when we consider that all the tools they had to work with were probably a broken knife and a file, their execution is really wonderful, as well as the æsthetic taste displayed in their design. A man called *Wækus* made out of gold coin a pair of bracelets, for the wife of the English Admiral on the station, of such beautiful design and execution, that they were universally admired. The same man afterwards designed the cast-iron railing now ornamenting the balcony of the Bank of British Columbia, in Victoria. He could scratch a fair portrait on ivory, and I have seen a bust of Shakespeare executed by him in slate from an engraving. My friend Mr. A. G. Dallas, late Governor-General of the Hudson's Bay Company territories, has a bust of himself executed in ivory by one of these Indians, than which nothing could be more excellently executed, or a better likeness. Often the figures in the "Illustrated London News," of the Assyrian sculptures, have been copied by them in slate, and the ethnologist who hereafter finds (as I have done) the "Men-Bull of Nineveh" among the northern Indians, must be cautious before he builds any extensive theory on the event! One of these Indians carved a chair for me, merely with a knife and some shark's skin, for polishing, of most admirable finish. If they could be induced to settle down and learn something of art, I have no doubt but that some of them would distinguish themselves. They are, however, like all savages, of too roving a disposition even to become adepts in any civilized art.*

The language spoken by these people, though varying in slight dialectic forms in different portions of the islands, is yet one and the same, and is distinct from all other of the languages of North-West America. It is confined to the Queen Charlotte Islands, and to the neighbouring islands of Kaiyá and Chowcheema, peopled by offshoots of this Hydah race. I formed, during my stay, a considerable vocabulary of it, which will be given in my general account of the Indian languages of North-West America in another place. It is sufficient for the present to give the numerals. They are as follow:—

* *Wækus*, already referred to, went north, and was shot by his chief in a drunken quarrel.

1. Squiesen.
2. Sting.
3. Squinn.
4. Siansick.
5. Klathel.
6. Kinnuthl.
7. Cisqua.

8. Sting-enna.
9. Klathen-swansego.
10. Klath.
11. Klath-en-squansen.
20. Klath-e-sting.
100. Klath-e-Klath.
1000. Lugwa-Klath.

The method of forming these numerals is at once apparent.

The Hydals are divided into seven tribes: 1. The *Skidegates*, claiming the whole of the sound of the same name, and the greater portion of the outside coast of Graham Island, and down to Gumschaw Harbour. 2. The *Loosicks*; Clew is their chief. They claim the Sound, and divide the rest of the east coast not claimed by the Skidegates between themselves and the next tribe. 3. Clews, about the southern portion of Moresby Island. 4. *Kung-at-adi*, on St. Anthony's Island, and near Cape St. James. Nuntens is their chief. They claim all the country up to near Tasso Harbour. There are no Indians here, but the (5) *Skitons*, or Gold Harbour Indians, claim all the coast up to Cape Knox. On the west coast of Graham's Island there was once a powerful tribe; but it has now become wholly extinct, and the coast is common ground. The northern end of Graham's Island is claimed by the (6) *Massets*, whose great chief is Edensaw. He is the wealthiest and most powerful chief on the island. Masset Harbour is only marked on the chart as a break in the coast, but it runs for about 20 miles in a southerly direction, with a large and beautiful river flowing in at the head. There are two Indian villages on the right-hand side of the harbour, and one on the left. The tribe is the largest in the island, and few of his people go south to Victoria, because he has more power over them than the other chiefs over their people. Edensaw is great friends with the young chief of Kaigani, who is a dangerous customer, and has vowed vengeance against the whites for killing his father, "Captain John," while attempting to make his escape, in a very bold manner, from the prison in Victoria, where he was confined for killing the Tongass chief in the streets of that town in 1860. Traders avoid his village on that account. The Massets travel south to Skidegate's village overland, keeping, for a short distance, by the sea, and take, according to the state of the trail and place where they strike into the interior, from one and a half to three, and even seven days. The Skidegates also travel by this way, and their journeys are generally taken in winter, when they are afraid to venture on the outside with their canoes. They are, however, very skilful and courageous canoe-men, sometimes, in crossing from the islands to the mainland, being out of sight of land for several days, and always for a few hours. They generally watch for a favourable breeze, and run over in their large, strong, war-canoes. In Virago Sound are also several villages, but whether they are independent or subject to Edensaw I have not been able to obtain any very certain information. Stansley's River here empties into the sea. It is said to flow out of a large lake in the interior, in which the river at Masset Harbour also takes its rise. On this lake the Indians declare there is a powerful tribe, who would slay the Coast Indians if they ventured there. This belief is common with all the Coast Indians regarding the interior of several portions of unexplored country. These Indians, only living on the coast, look upon the interior just as quaint Sir John Mandeville did when he came to a country he knew nothing about, "This land is all full of devils." The Indians also cross overland from Virago Sound to the opposite coast, and represent the country as thickly wooded and mountainous. 7. The *Gumschaws* claim the harbour of the same name, and the adjoining territory. In 1830 the Hudson's Bay Company estimated the number of Indians on these islands at about 8500, but as these are derived from what they call their "trading lists," which generally, I have found, under-estimate their number,

the population at that date may be taken at 10,000. I have heard it estimated even much higher. Since that period intestine and foreign war, disease, debauchery, and general decay, have decimated their number. I do not suppose that, at the present day, there are more than 5000 Hydahs, all told, and not more than 3000 permanently, or at one time, resident on the islands, many annually coming south to Victoria, Puget Sound, &c., to work for the whites, or to prostitute their women. Small-pox has also destroyed numbers, but not to the same extent as in other tribes—their insular position protecting them. In 1862, when this disease broke out among the southern tribes, the Hydahs, who were wintering in Victoria, fled north with the seeds of infection. While waiting, as is their custom, on an island off the mainland for a favourable chance to cross over, the disease broke out in all its virulence. Not one survived. A trader described to me, coming upon their bodies in the ensuing spring, that a more terrible sight no man ever looked on than these ghastly skeletons, surrounded with their rotting canoes and treasures. For a long time no Indian would approach this island, and, for aught I know, the Hydahs' bones lie unburied yet. Vice, and its accompanying diseases, have also harried them, and numbers annually succumb in Victoria to debauchery. As might be expected, they are not increasing in number, but the contrary; and few children are seen in their villages. I had an Indian boy as interpreter, who used to count on his fingers, with the most cold-blooded callousness, when the last of his race would become extinct. I believe that he estimated that interesting *dénouement* at twenty years! The Hydahs generally cross to the mainland from the northern portion of the island, but, in fine weather, the Skidegates, and other southern tribes of the island, cross to Nepean Sound, near the village, and on the territory of the Bella Bella Indians, with whom they have long been at war; and, though peace has been made, yet it has as repeatedly been broken through by some treacherous, bloodthirsty act on the Hydahs' part. The Bella Bella tribe was at one time very powerful, and the terror of the Hydahs, for whom they used to lie in wait. On one occasion they are said to have captured upwards of 100 of that tribe on their way south, and to have beheaded them in the most cruel manner on an island where the village is now built. Times are changed, however, and the Bella Bellas have been thinned by small-pox. The Hydahs, however, when not in large numbers, prefer going outside, to risk passing the village, which is now removed to an island, to prevent surprise. A sad time have these Hydahs before reaching Victoria, for they are hated, and, *igitur*, attacked by every tribe powerful enough to do so.

6. *Vegetation, Soil, &c.*—The whole of the islands, with the exception of some insignificant patches of open land, are wooded down to the water's edge, the sea in many places laving the very roots of the trees. This forest consists of the ordinary conifers and deciduous trees common to the North Pacific. Menzies spruce (*Abies Menziesii*, Dougl.) is the most common tree, and in some places attains gigantic proportions. The undergrowth is mainly "salal" (*Gaultheria shallon*, Pursh.), which, in this wet climate, attains much greater luxuriance than further south; *Abies Douglasii*, Lindl., I did not see; and, as far as my observation extends, this tree does not extend further north than Milbank Sound in 52° N. lat. No sort of cultivated plant is grown by the natives except potatoes, which are produced in more considerable quantities than by any other tribe or race of Indians, and of very excellent quality. At one time there was, and for all I know to the contrary is still, a sort of annual "potato fair" held on these islands, where other tribes came to barter their products for the Hydah potatoes. My visit was rather too early in the season for flowering plants or the higher cryptogams, and, so far as my collection went, I did not discover one plant new or peculiar to the islands.

The cryptogamic plants collected by me on these islands, or in the neigh-

bouring sea, will be found incidentally noted in papers in the 'Transactions of the Botanical Society of Edinburgh,' 1867-8 et seq.

7. *Zoology, Fisheries, &c.*—Most of the wild animals of the North Pacific are found on these islands or frequenting the sea laving their shores. A remarkable exception is, however, any species of deer or wolf, a natural sequence, though both are most abundant on the mainland immediately adjoining; racoon (*Procyon hernandezii*) are also said to be absent. I saw no beaver either, but they are reported to be found. Numbers of bears (*Ursus americanus*) and sea otters are found, and on the west coast and on Prevost's Islands are many large fur seals (*Callorhinus ursinus*, (Schreb.) Gray?). Only one species of salmon visits the islands. This is probably the *Salmo gairdneri*, Rich., and arrives in May. Accordingly, most of their supplies of salmon are bought from the Tsimshians and other tribes on the mainland. Sea-fish are abundant enough. Halibut are caught in great quantities on the west coast of Graham's Island, and hither the Indians resort every year to catch, split, and dry them for winter use.

8. *Capabilities for Settlement.*—An Anglo-Saxon cannot leave any subject without scrutinizing the *cul de sac* prospects of it, and to leave a country without considering its colonizing capabilities would be playing false to the instincts and genius of our race. A very few words will dismiss this subject and conclude these geographical memoranda. The soil is poor, and the country being thickly wooded, I do not think that, even under the most favourable circumstances, it will ever be worth settling on for agricultural purposes. The climate is so wet that, though wheat and other cereals might be cultivated, crops would be very precarious. So long as the better countries of Vancouver Island, British Columbia, &c., are lying waste further south inviting settlement, Queen Charlotte Islands must remain only hopeful as a mining and aboriginal stronghold. Hunters might find it profitable to kill sea otters here; these animals being very valuable and said to be most abundant on the western shores of the islands. The fierce character of the natives would, however, render any attempts at permanent settlements, unless in strong parties, dangerous. In one sentence, to conclude, these islands are more interesting to the geographer than to the colonist; to the miner they may be valuable, but to the agriculturist they are useless.

11. Letter from Mr. T. T. COOPER, on the course of the Tsan-po and Irrawaddy and on Tibet.

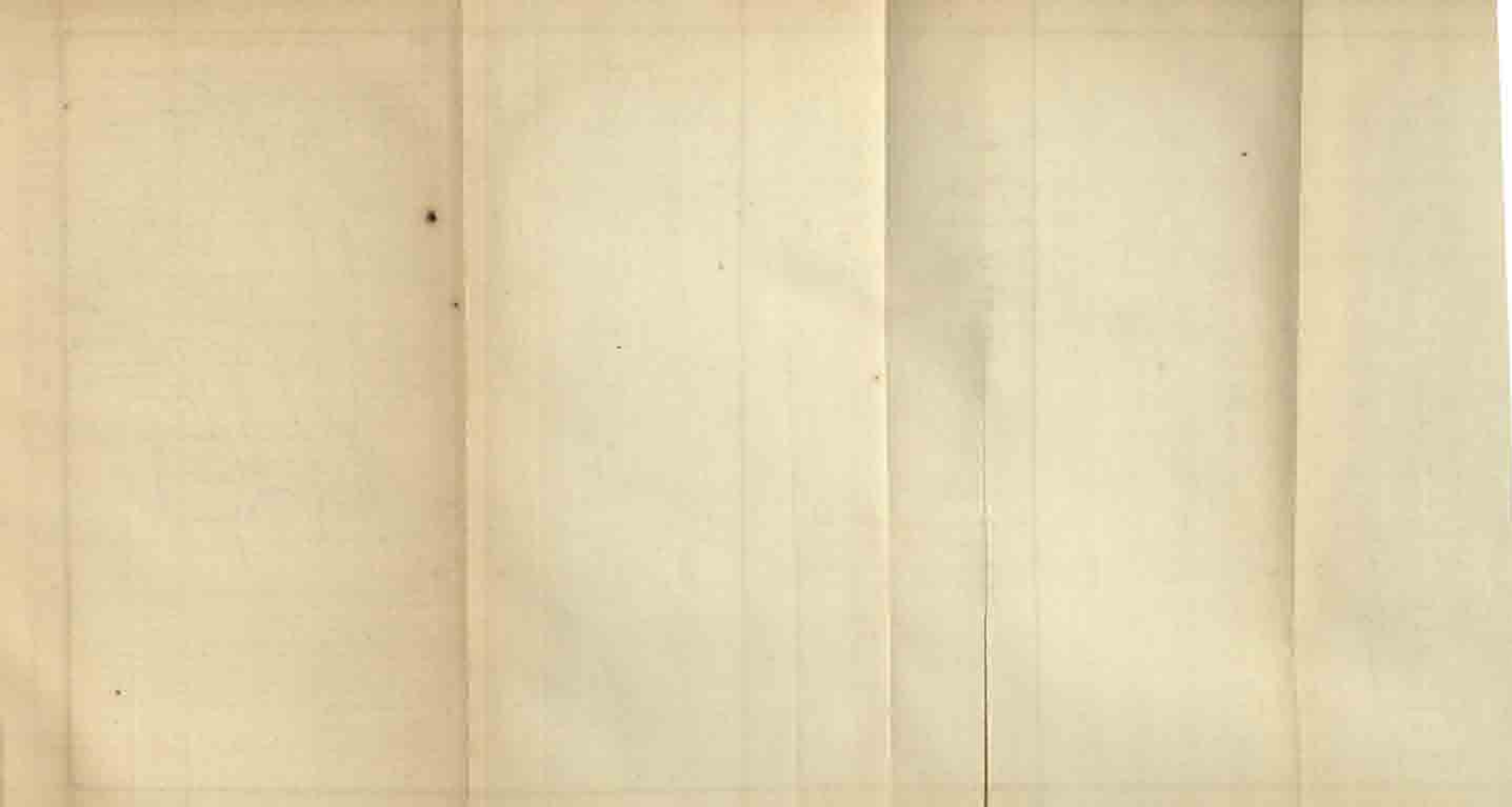
"DEAR SIR,

"Calcutta, 8th May, 1869.

"While travelling in the Eastern Kingdom of Tibet last year, I met several French missionaries, and induced one of them who has travelled extensively in that part of Tibet, to put on paper the notes, copy of which I enclose.

"You will observe that he remarks,—'I am almost certain that the great River Yar-Kloute-tsan-Po, which comes from the west of Tibet, and passes a little south of Lassa, is the same as the Irrawaddy, and does not flow into the Brahmapootra.'* When he told me this in Bathang, I was struck with the great importance, geographically speaking, of determining this question, and from time to time made inquiries relative to this river. The most important, though not in my mind conclusive, information that I got was from a Chinese

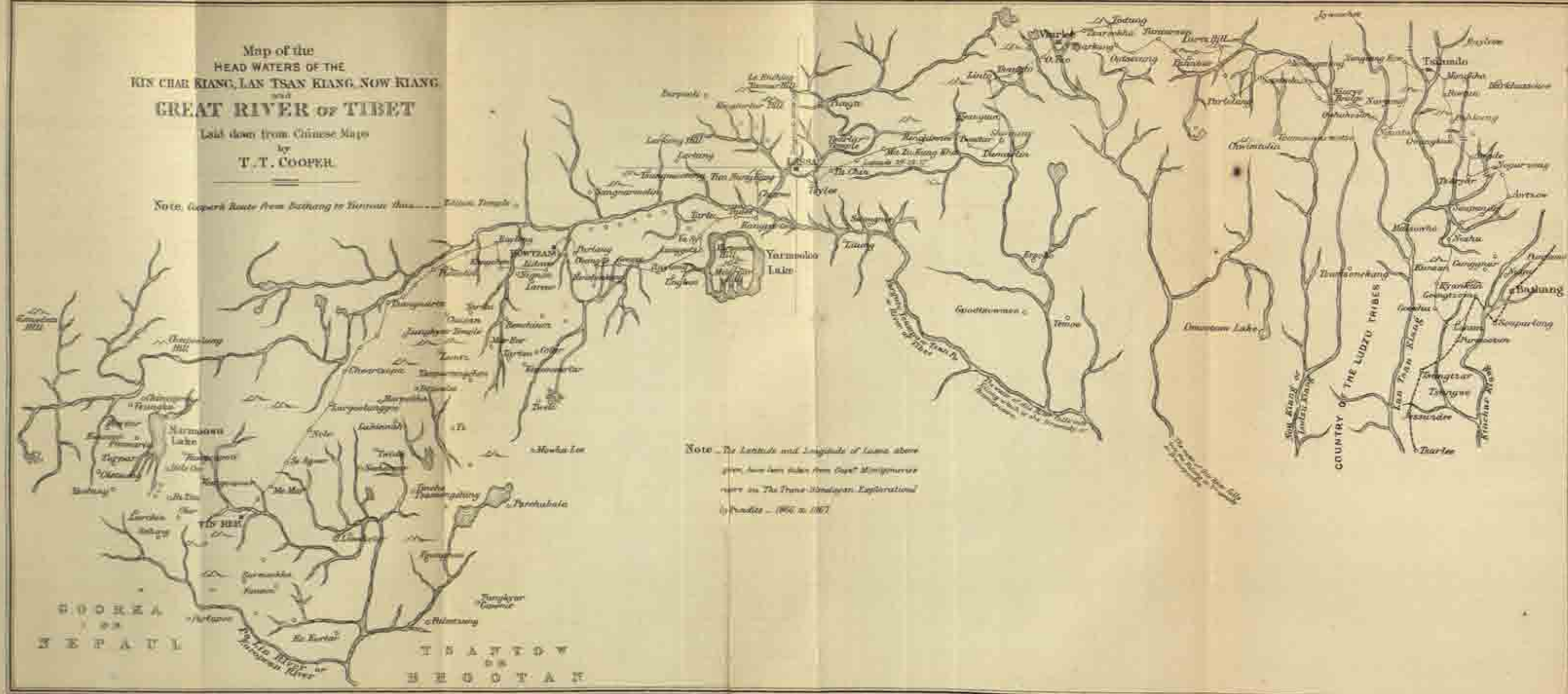
* Note by Sir H. C. Rawlinson:—"Zy-ya, on the San-po is only 25 miles from Sadiya, according to Cooper. How, then, is it possible that the Brahmapootra, a great navigable river, can be formed in this interval?"



Map of the
HEAD WATERS OF THE
KIN CHAI KIANG, LAN TSAN KIANG, NOW KIANG
and
GREAT RIVER OF TIBET
Laid down from Chinese Maps
by
T. T. COOPER.

Note: Cooper's Route from Batang to Yunnan thus.....

Note: The Latitude and Longitude of Luina above
given, have been taken from Capt. Minnie's
report on The Trans-Himalayan Explorations
(i) Prudhoe - (1866 to 1867)



merchant who had come from a trading post called Zy-yu, which he described as situated at the eastern foot of the Himalayas or Great Hills separating Assam from Tibet. The road from this place to Bathang, where I met him, he described as leading over four great rivers, viz., the Tsau-po near Zy-yu to the east, the Nou Kiang, Lantseu Kiang, and Kin-chu Kiang.

"At the time that I gathered this information I had with me a Chinese map which I bought in Chung King, a tracing of which I enclose. The topographical correctness of this map I have considerable faith in, but of course it contains errors, the most material of which is the southerly bend that the great river of Tibet takes to the west of Lassa.

"It is a matter of great regret to me that I cannot identify the waters of the great river of Tibet which falls into the Yarlung River as the continuation of the Irrawaddy, or the Irrawaddy under the name of the Yarlung,* but it seems to me certain that the Yarlung is either the Irrawaddy or Brahmapootra.

"The tracing, while it does not throw any light on the question of the Irrawaddy taking its rise in Tibet, gives more information with regard to the head waters of the Nou Kiang, Lan-tseu Kiang, Kin Chai Kiang, and Tsau-po rivers than any European maps that I have seen, and I have thought that it might be useful placed in the hands of the Royal Geographical Society.

"I leave Calcutta this evening for Bathang, *via* Sudiya, and hope, in the event of getting through, to be able to set the question which has been the subject of this letter at rest.

"I think perhaps if Dr. T. F. Wade, the eminent Chinese scholar, had a copy of this tracing he might be able to glean from Chinese maps more information with regard to the great river of Tibet, as I believe he has the largest collection of Chinese works in China.

"I am, Sir, yours faithfully,

T. T. COOPER.

"To Sir Roderick Murchison,

"President Royal Geographical Society."

NOTES ON TIBET, BY A FRENCH MISSIONARY.

I am almost certain that the great river Yar-khoute-tsan-Po, which comes from the west of Tibet, and passes a little south of Lassa, is the same as the Irrawaddy, and does not flow into the Brahmapootra. The River Lou-tse Kiang (in the Tibetan language Ngwukio), which comes from the north of Tibet, flowing first on the south-east, then to the south-south-west, is the same as the Salween, which divides Siam from Burmah and flows into the Gulf of Martaban.

The Lan-tseu Kiang follows almost constantly the same direction as the Lou-tse Kiang as far down as the 20th degree of lat. north, from where it flows through Laos, Annam, and Cochin China to Saigon, where it is called Mei Kong: the Tibetans call it La Kio or Ta Kio.

The Yang-tse Kiang also follows almost the same direction as far as about the 27th lat. north; then, going to the north-east through China, flows to Nanking, as it is drawn on the maps. This river is called by Tibetans Djro Kio.

Between these four rivers are ranges of mountains, which are generally covered with snow for the most part almost the whole year. At the north these mountains are much higher than at the south. At the south of Yunnan, or in Burmah, these mountains dwindle into mere hills.

* This river, of course, is not the branch of the Yang-tse which bears that name.

Tibet is now divided into three principal provinces:—1st. On the west from Ladakh and Bushire, to the north of the Goorkas and of Nepal, is the province of Ngari. 2nd. To the north of Nepal, Sikkim, and Bootan, is the province of Tsan, extending towards the east as far as the town of Tali on the high road. 3rd. On the east, north of the Lopa (Abords) of the Nahanga (Mishmoo) and of several wild tribes, is the province of the Kam, but it must be remarked that the whole of these territories do not belong to the kingdom of Lassa. 1st. In the Government of Ngari there is the principality of Sakia, which is independent, as well of the temporal as of the spiritual power of Lassa. 2nd. On the south-east part of Tibet, between the River Yar-Klouto-tan-Po (Irrawaddy) and the Lou-tse Kiang, and the high road (on the north), there is the principality of Pomi, which does not acknowledge the civil power of Lassa. 3rd. We must say the same of the two principalities of Tchraya and Kiando (Tchanton) between the Lou-tse Kiang, Lan-tsan Kiang, and Yang-tse Kiang on the east part of Tibet. I do not know which is the chief town of Ngari; the capital of Tibet, Lassa, and Trachilumbo are the two principal towns of the Tsang. Tchanton and Kiangka are the chief towns of the Kam.

These three great provinces are divided into prefectures governed by a Delu, and under prefectures governed by a Chelngo.

Roads.—From China there are three roads leading to Tibet:—

1st. The Mandarin Road, starting from Tchem-tou-fou, Tatsien-lou, Litang, and Patang, entering into Tibet near Kiangka, going to the north at Tchraya and Kiando, to the west through Tali, Kiando, and reaching Lassa.

2nd. The old Mandarin Road coming from Yun-nan, Tali, by Kiang, Our Sy, entering into Tibet near Atentze, crossing the districts of Tsarang of Dsaryul at the foot of the Himalaya near the Mishmoo and south of Pomi; then, running along the Himalaya through the districts of Mun pa and Kongpon, reaches Lassa. If from Atentze one goes straight to the north, on the banks of the Lan-tsan Kiang, the road is met with at Kiang Kang; but in crossing the Lou-tse Kiang at Kia ta, where there are salt-pits and the mountain behind, a small river named Ou Kio is met with. Going up this small river, which comes from a high table-land between the Lan-tsan Kiang and the Lou-tse Kiang, the Mandarin Road at Kiando, or at the Kiayu Kio, is struck, where the Lou-tse Kiang is crossed by a good bridge.

3rd. There is also a road from the Chinese province of Kan Siau, or Mongolia, and Koo Koo Noor, to Lassa. This road has been described by the Rev. Father Hue.

From India to Tibet there are also many roads.

1st. From Simla, going up the Sutlej River, a road leads into the province of Ngari on the most western part of Tibet.

2nd. Through Nepal there is another road well known to the English.

3rd. Through Darjeeling and Sikkim along the Tista River, there is a road; if one goes to Lassa through Tin ja and Trachilumbo, at least 19 or 20 days is required; but I have been told that there is a shorter road along the top of high table-lands straight to Lassa; for about eight days' journey the road is plain.

4th. Through Bootan there is a road rather difficult, I think, but practicable.

5th. During the year 1854, MM. Krick and Bourry passed through Upper Assam and the Mishmoo country, and reached the Tibetan District of Dsaryul, where they were murdered by the Mishmoo by order of the Tibetans of Dsaryul. If the English could open a road through the Mishmoo country they would find at Dsaryul the old Mandarin Road coming from Yun-nan, of which I have spoken before (No. 2).

6th. I am also told that from Bhamo into Burmah there is a small river flowing between the Irrawaddy and the Lou-tse Kiang, amongst the savages

tribes of Remapunga, Didjooes, Telous, Pagni, and entering Tibet through the districts of Dzayul and Song-ngag kien dzong, it has its source in the principality of Pomi. People say that this road is not very difficult, but there are many dangers to be feared from the savage tribes. This road meets also the old Mandarin Road coming from Yun-nan into Dzayul or near Song-ngag kien dzong.

The Road No. 2 (old Mandarin Road from Yun-nan) passes through the richest districts of Tibet, which are Tsa rong, Dzayul, Mun pa, and Kong pa.

TRADE.—I. *Importation into Tibet*.—1st. First of all *tea*, because Tibetans cannot live without it; but the Chinese Government will be opposed to that trade as much as possible, because the whole of the tea going to Tibet comes from China;

2nd. Good strong silk cloth, especially if flowered or watered, or with golden or silvery application (red, green, maroon, white).

3rd. Broad cloth; the best colours are red, green, and maroon.

4th. Simple and double cotton cloth (colours as before and blue).

5th. Precious stones, especially coral, blue, green, red, yellow; the round or oblong ones must have a hole to pass a string; the flat ones must be well polished.

6th. Watches, clocks, guns, and every kind of European curiosities, looking-glasses, silk and cotton, coloured thread, lace, &c., &c.

II. *Exportation from Tibet*.—1st. Mines of every description to be opened and worked out.

2nd. From the north and high table-lands, great quantity of wool and goat's hair.

3rd. Especially from the districts at the foot of the Himalaya mountains, musk; the best comes from the Mishmies.

4th. Rhubarb, madder, Houang liem (a yellow dye and medicine).

5th. Bullocks' skins, horns, furs.

6th. On the western part of Tibet plenty of borax is to be found.

7th. Good horses could be procured in Tibet, &c., &c., &c.

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